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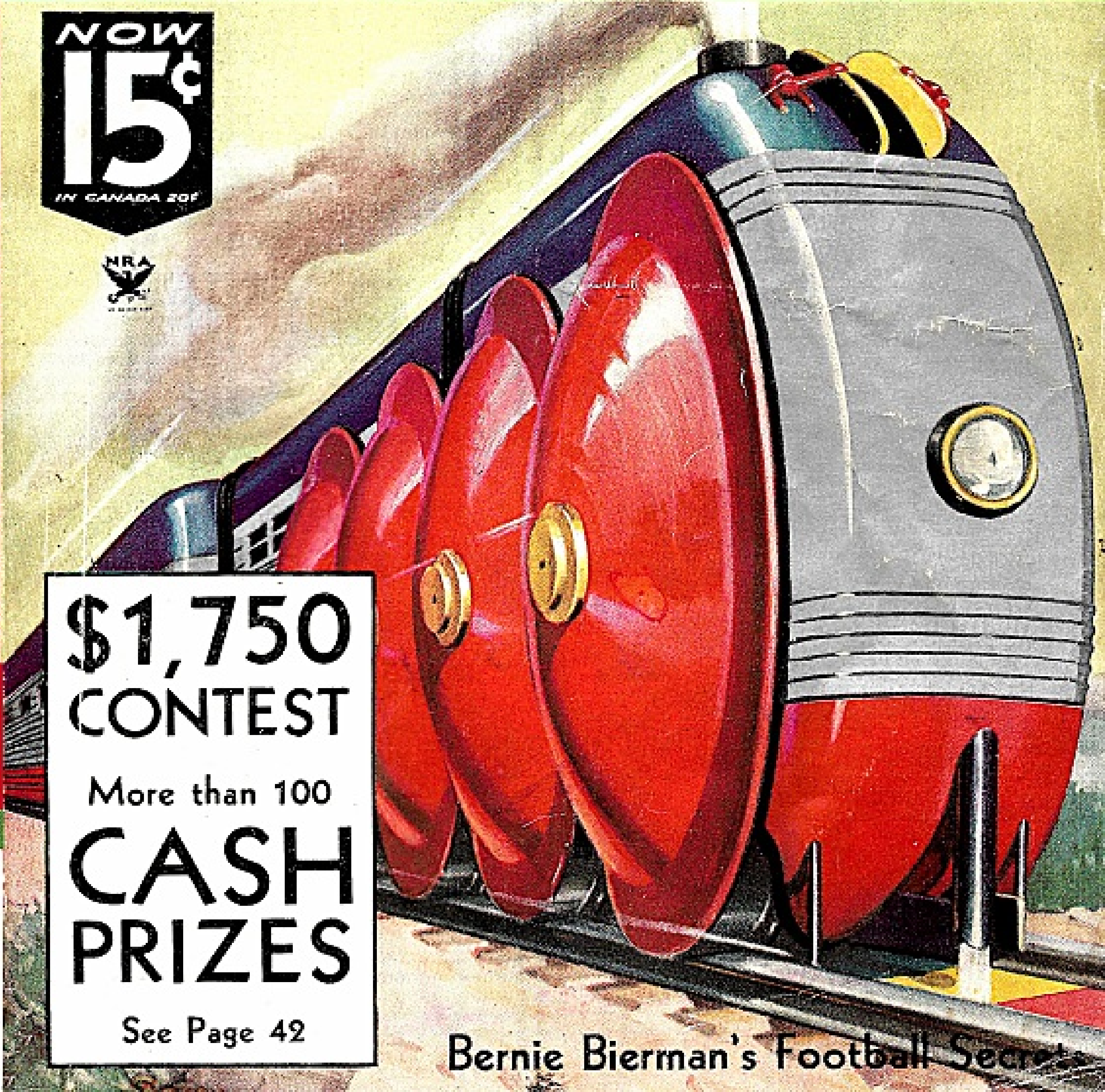

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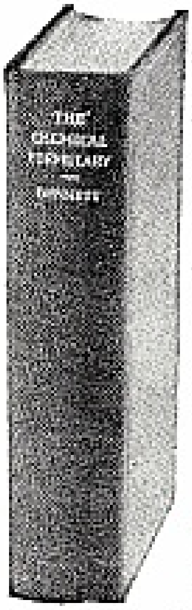

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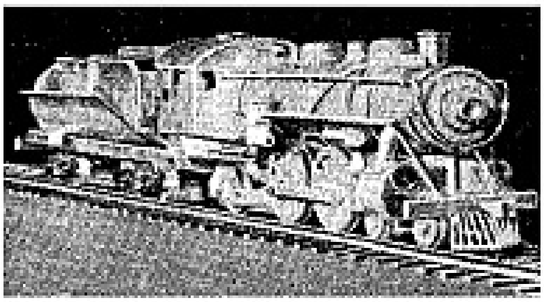
Build "Tiny Tom," A Real Miniature Locomotive



"Tiny Tom", the model locomotive shown here, looks like the real thing, and yet is no longer than an ordinary pencil. Full size drawings and instructions for building this excellent working model can be found on page 96 of this issue.

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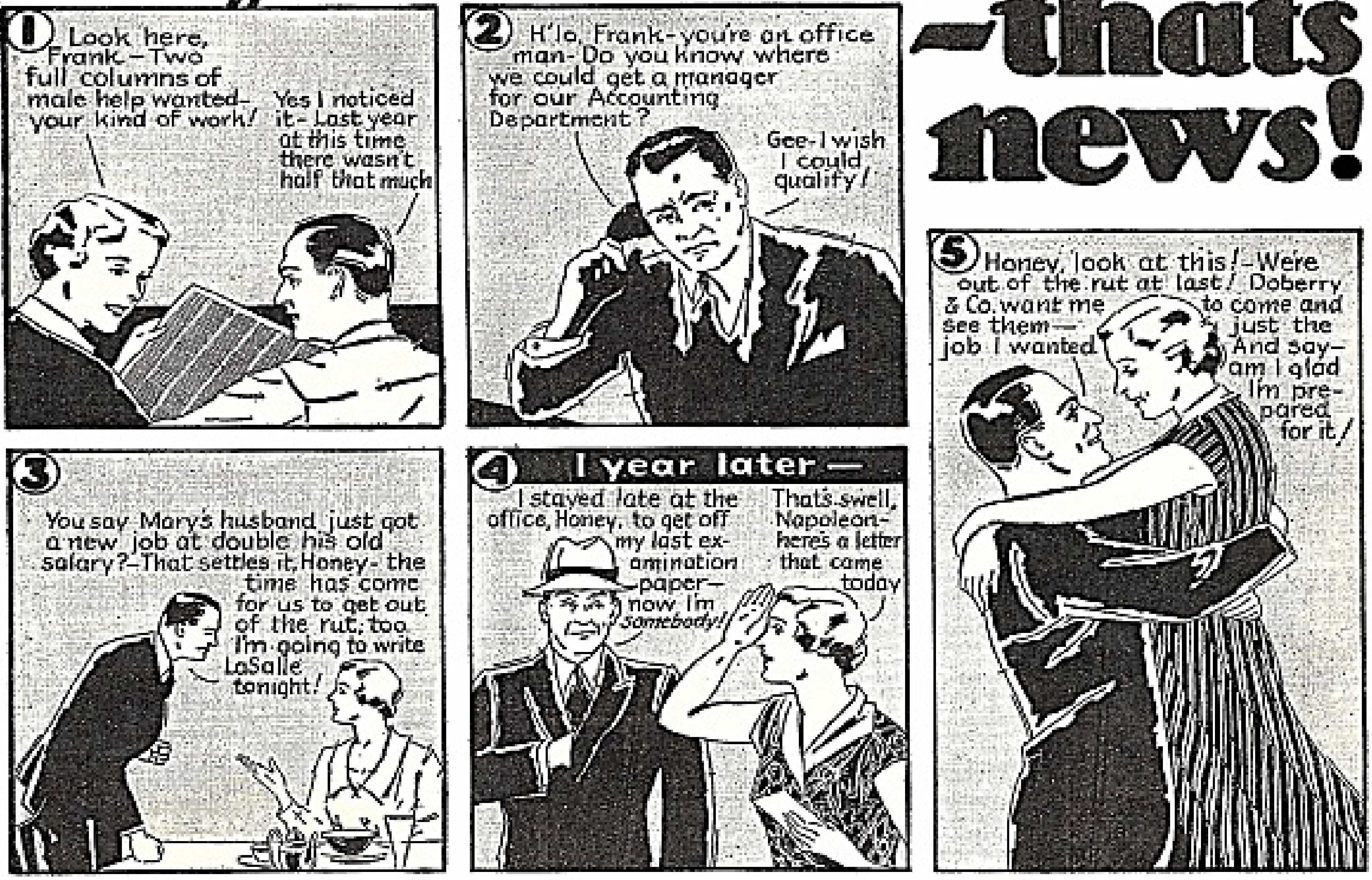
When jobs are looking for men —thats news!


1
Look here, Frank—Two full columns of male help wanted—your kind of work!
Yes I noticed it—Last year at this time there wasn't half that much
2
H'lo, Frank—you're an office man—Do you know where we could get a manager for our Accounting Department?
Gee—I wish I could qualify!
3
You say Mary's husband just got a new job at double his old salary?—That settles it, Honey—the time has come for us to get out of the rut, too. I'm going to write LaSalle tonight!
4
1 year later—
I stayed late at the office, Honey, to get off my last examination paper—now I'm *somebody!*
That's swell, Napoleon—here's a letter that came today
5
Honey, look at this!—We're out of the rut at last! Doberry & Co. want me to come and see them—just the job I wanted. And say—am I glad I'm prepared for it!

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RIGHT now, in many lines there is a search for really *good* men—managers, leaders—men who can take charge of departments, businesses, branch offices, and set things humming.

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Ordinarily, there would be plenty of men to fill these jobs—men in junior positions who have been studying in spare time. But most men have been letting their training slide during these dark years of depression . . . "What's the use?"—You have heard them say. Perhaps there has been some excuse for sticking to any old kind of a job one could get the past few years—but the door is wide open for the man with ambition *NOW!*

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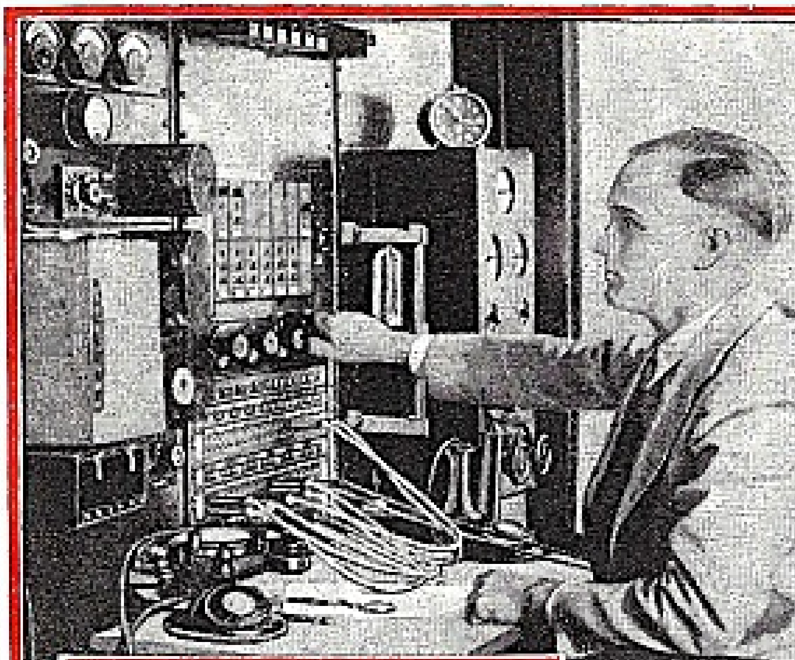

J. E. SMITH
President National Radio Institute
The man who has directed the Home Study Training of more men for the Radio Industry than any other man in America.

If you are dissatisfied with your present job—if you are struggling along in a rut with little or no prospect of anything better than a skinny pay envelope—**Clip and Mail the Coupon NOW!** Get my big 64-page FREE BOOK on the opportunities in Radio. Read how quickly you can learn at home in your spare time to be a Radio Expert—what good jobs my graduates have been getting—real jobs with real futures.

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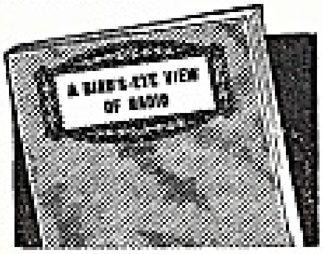

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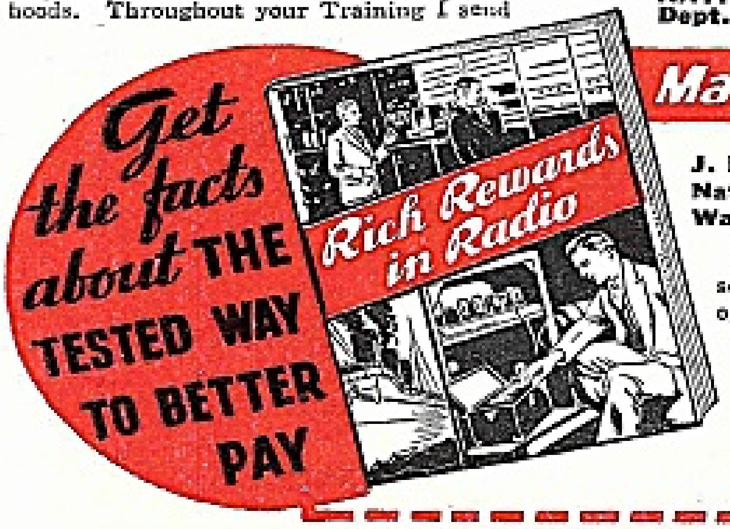
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26	1057	39	708
27	1030	40	682
28	1003	41	657
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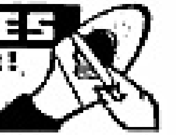

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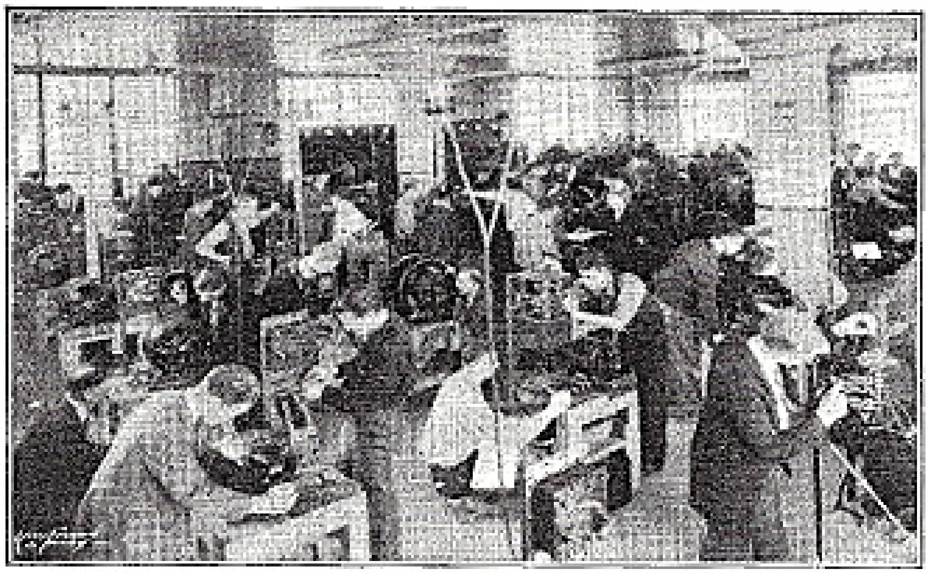

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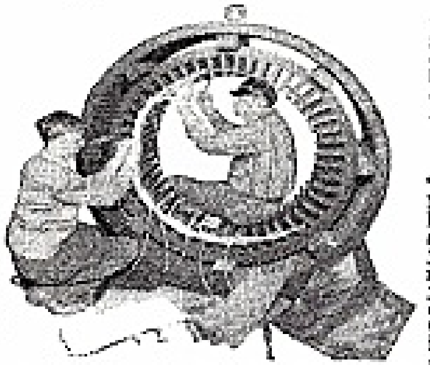

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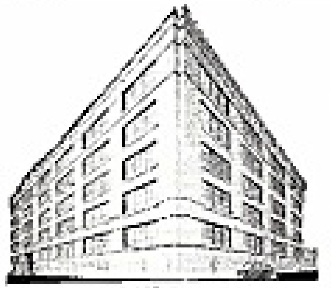

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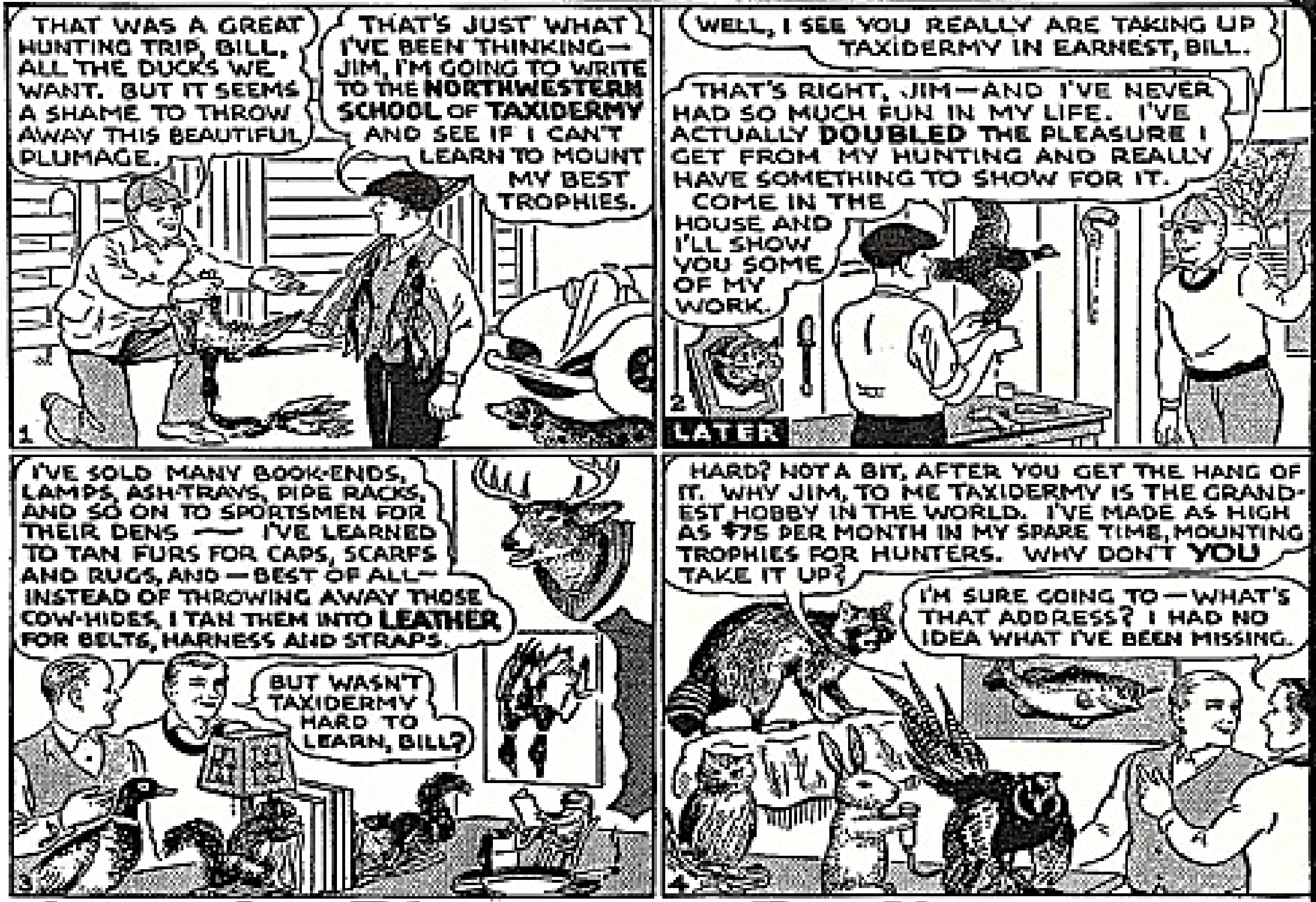
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1
WELL, I SEE YOU REALLY ARE TAKING UP TAXIDERMY IN EARNEST, BILL.
THAT'S RIGHT, JIM—AND I'VE NEVER HAD SO MUCH FUN IN MY LIFE. I'VE ACTUALLY DOUBLED THE PLEASURE I GET FROM MY HUNTING AND REALLY HAVE SOMETHING TO SHOW FOR IT.
COME IN THE HOUSE AND I'LL SHOW YOU SOME OF MY WORK.
2
LATER
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BUT WASN'T TAXIDERMY HARD TO LEARN, BILL?
3
HARD? NOT A BIT, AFTER YOU GET THE HANG OF IT. WHY JIM, TO ME TAXIDERMY IS THE GRANDEST HOBBY IN THE WORLD. I'VE MADE AS HIGH AS $75 PER MONTH IN MY SPARE TIME, MOUNTING TROPHIES FOR HUNTERS. WHY DON'T YOU TAKE IT UP?
I'M SURE GOING TO — WHAT'S THAT ADDRESS? I HAD NO IDEA WHAT I'VE BEEN MISSING.
4

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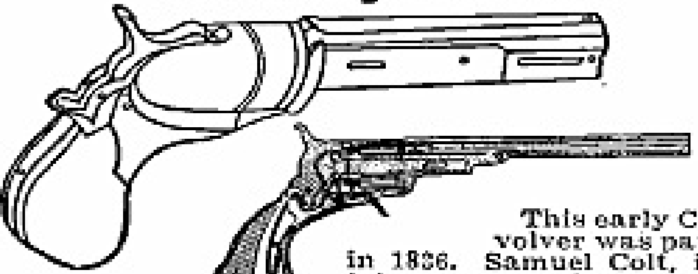
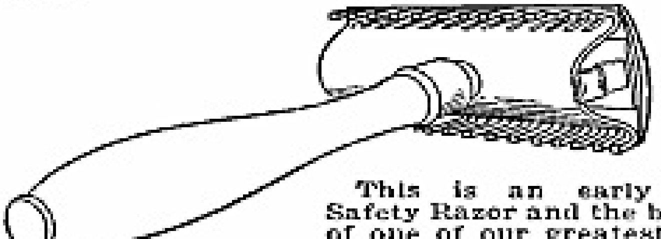
An Early Revolver



This early Colt revolver was patented in 1836. Samuel Colt, its originator, was known as the boy inventor. While still a lad he ran away to sea and whittled the first model of a repeating fire-arm out of wood during his leisure moments on shipboard. Colt is a good example of the inventor who was persevering. Three years later, in 1839, he had made improvements to produce the second revolver shown here. It was used in the Mexican War with excellent effect. By 1852, Colt had the largest firearms factory in the world. Colt died a very wealthy man.



This is an early Gillette Safety Razor and the beginning of one of our greatest modern commercial enterprises. Millions of safety razors have since been sold all over the world and millions of dollars of profit have been made. For centuries men shaved with the old straight edge razor. Then came Gillette with his happy idea.

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Look around in any direction today and see the inventor's handiwork. Many of the most successful inventions have been the small things found in ten-cent stores, drug stores, hardware stores and the like. Many inventions have come from men who did not consider themselves inventors at all. **If you have an idea which in your judgment will make money, save money, save time, save labor or give pleasure—then see about protecting your rights to it.** It costs you nothing to learn the facts. The Patent Laws were made to protect the poor man and the rich man alike. **But you must know how to take advantage of them.**

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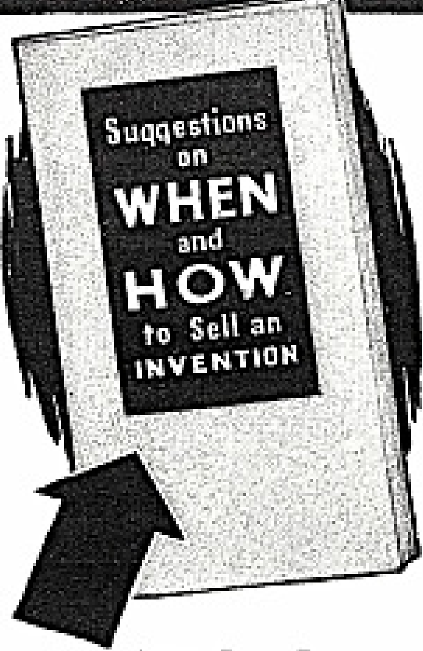

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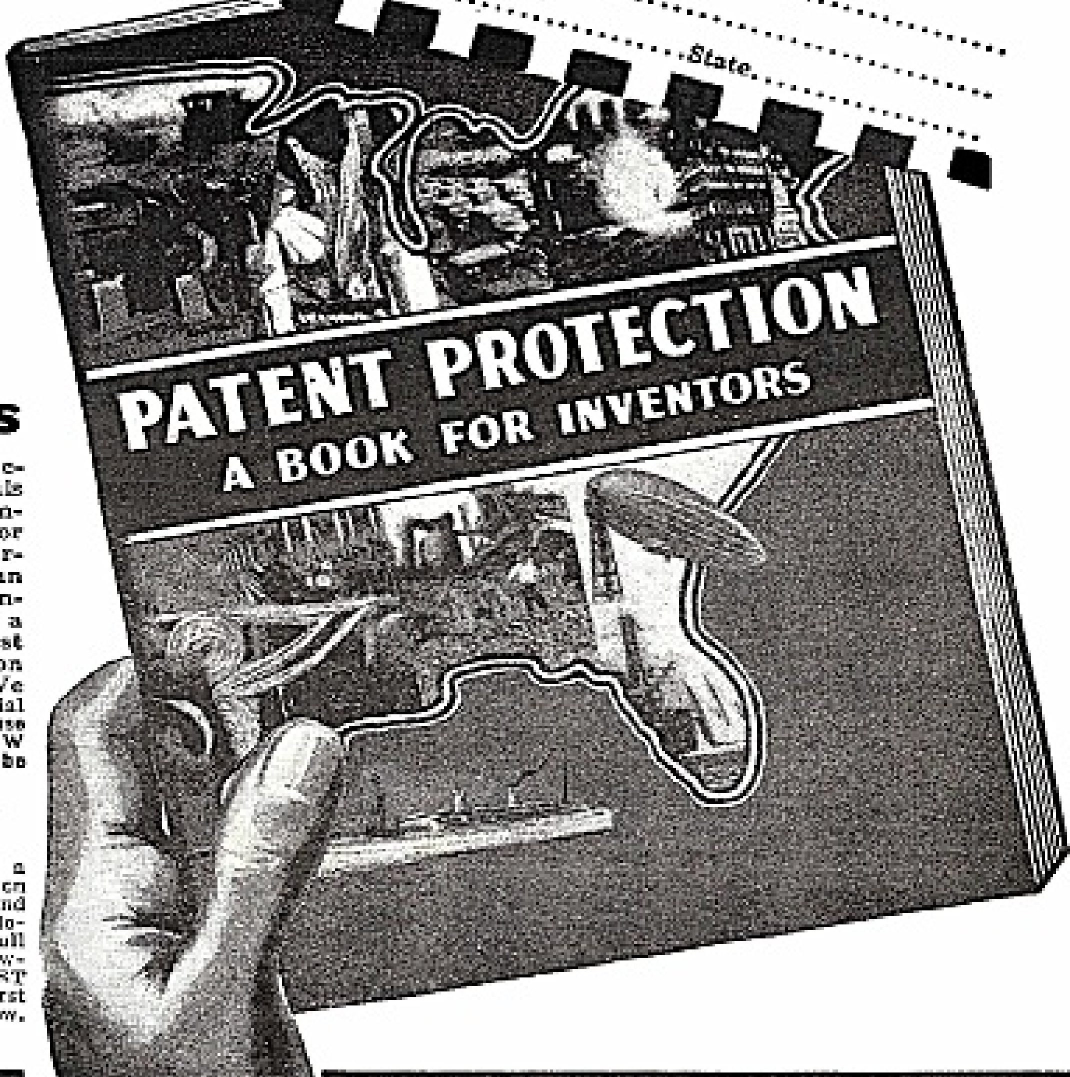

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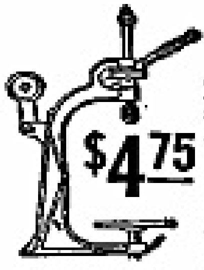

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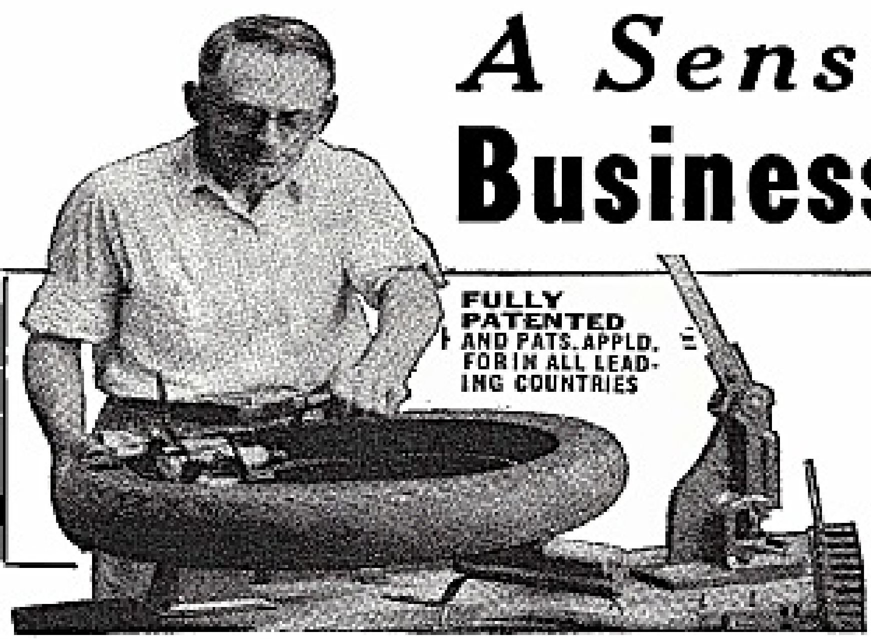
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◆

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◆

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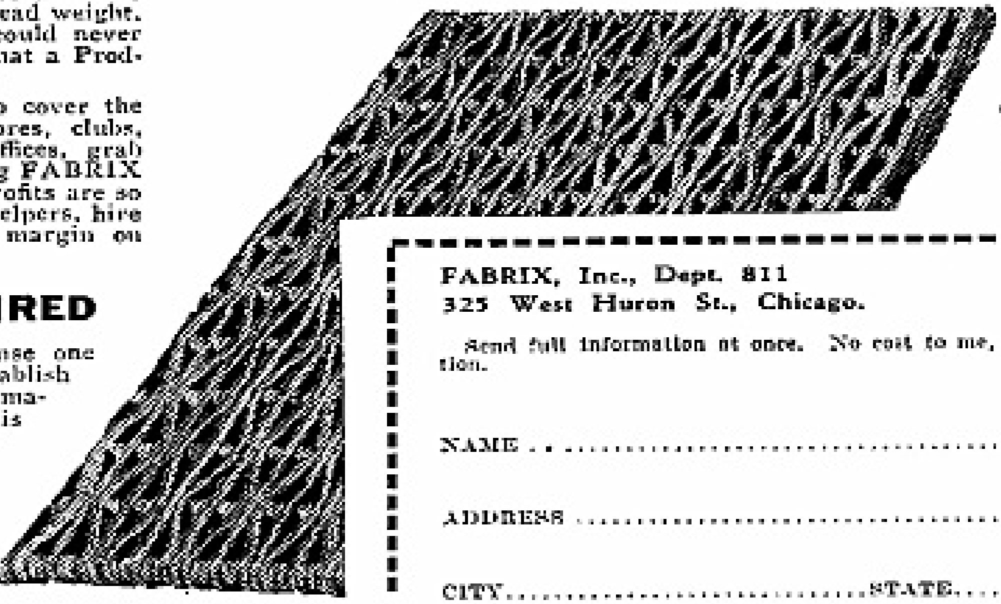

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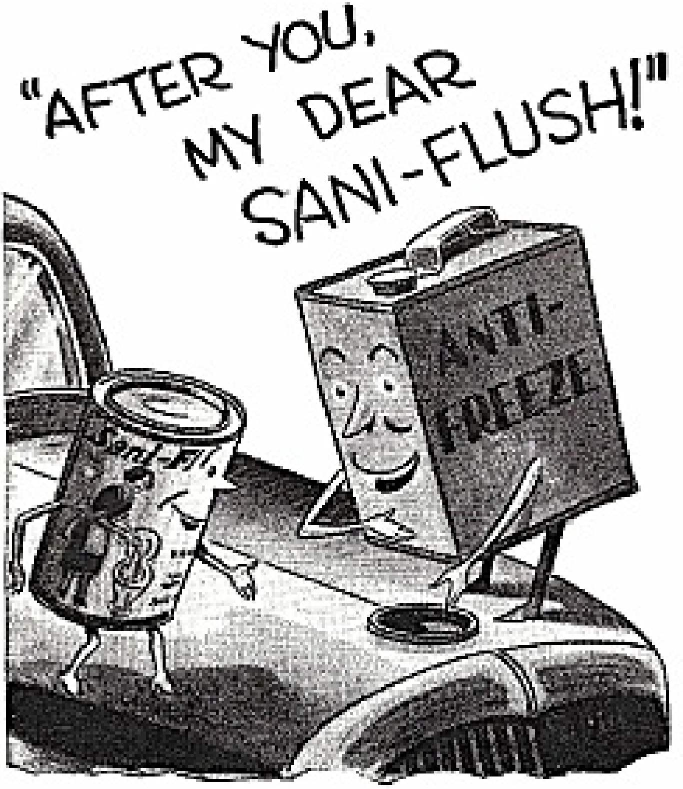
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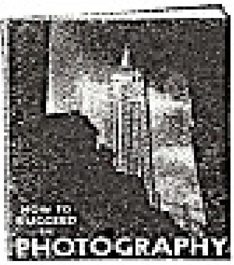

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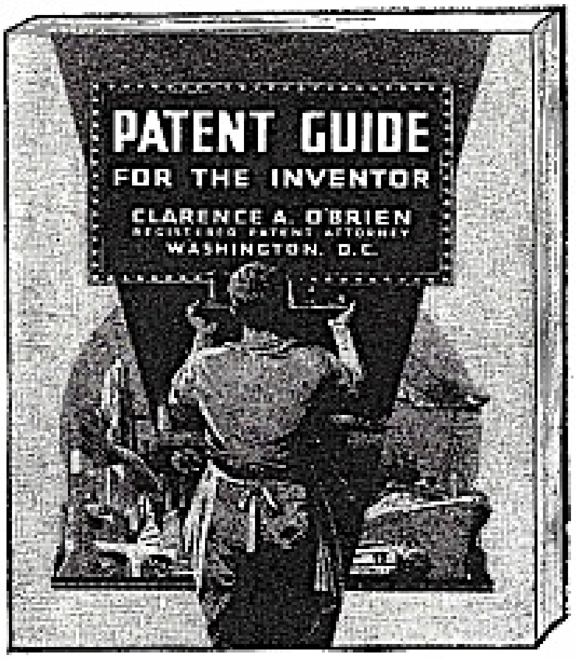

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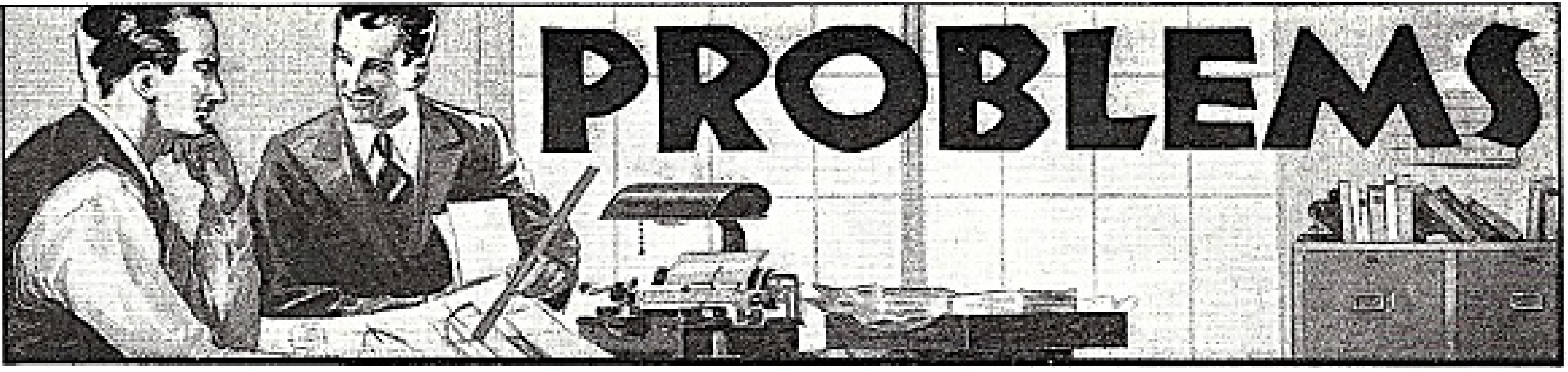

Have YOU a Question for MM's Advisory Experts?

BLACKENED RADIO TUBES

On some new radio tubes I have noticed a black substance on the inside of the glass walls. What is this material?—J. S., St. Paul, Minn.

This black coating is a carbon deposit sprayed on the walls of certain tubes to prevent electronic bombardment of the inner glass walls and to lengthen the overall life of the tube. High speed electrons impacting upon the glass walls would otherwise knock off glass particles, perhaps even make holes through the glass.—*L. S. Markus, Electrical Engineer.*

MAKING A DOG SPEAK

Please tell me how to make my dog "Pepper" speak.—L. J., Duluth, Minn.

Have a friend go to the back door of your home and make a peculiar noise. Take your dog to the door on the inside, and try to excite him, at the same time commanding "Speak." Reward him with a bit of food when he responds. Repeat until he will bark immediately on command.—*Earl Craig, Dog Trainer.*

FIGURING CENTRIFUGAL FORCE

In making controllable pitch propellers for self-governing wind-electric plants, I must compute the centrifugal force of the governor weights. Can you give me the equation?—A. B. K., Frazer, Mont.

Centrifugal force may be computed by the following formula, where W is the weight in pounds, n is the speed in r.p.m., and r is the distance in feet from the shaft to the center of the weight: Force in pounds $= .00034\ Wn^2r$.

SEMI-AUTOMATIC RIFLES

Please tell me how military semi-automatic rifles utilize the power of the explosion to eject the empty cartridge, close the bolt, and place a new cartridge in the chamber.—W. W. M., St. Paul, Minn.

One type of semi-automatic rifle, the 1928 Garand, is gas-operated. It has a cap over the end of the barrel, and a gas piston underneath. After the bullet leaves the muzzle, and before it has gone out through the cap, some of the gas of the exploding powder pushes on the piston and operates the breech mechanism. This gun can fire ten shots as fast as a man can squeeze the trigger.—*R. W. Gordon, Associate Editor, The Infantry Journal.*

CHANGING BOAT DIMENSIONS

If I increase the length of the 16½-foot Doane hydroplane two feet, do I alter the width too? Could a Ford V-8 engine weighing 510 pounds be used here, whereas a 300-pound engine is specified for the original boat?—G. H. A., New South Wales, Australia.

We do not as a rule encourage the alteration of any published boat design, especially in the case of a hydroplane where balance, the keynote to performance, is such a delicate proposition. Naval architects in changing boat sizes increase all linear dimensions in *direct proportion.* Weights, however, must be increased in proportion to the *cubes* of the linear dimensions, making calculations quite complicated. In the above case the increase in length is just about enough to allow use of the heavier engine.

Keep the Ford engine as low as possible in the boat; when traveling wide open the boat will be a bit hard to handle, and may spill you on the turns.—*Sam Rabl, Naval Architect.*

ELECTRIFIED GARBAGE CANS

Can garbage cans which have been charged with electricity to keep out stray dogs and cats become dangerous to human beings in wet weather?—J. R. P., Cleveland, Ohio.

Yes. Although shock systems used to ward off animals are supposed to operate at low voltages or with currents of high frequency, ordinarily not dangerous, the National Safety Council of Chicago points out that such systems may become very dangerous at times.

[*Continued on page* 20]

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I'LL give you PROOF in 7 days that I can turn you, too, into a man of might and muscle. Just think of it! Right in the first week under my guidance you will see and feel the improvement! Then as my weekly instructions arrive in your home you continue to re-build, renew and "overhaul" your body. By the end of three months you are the owner of a powerful body that you will be proud to display anywhere, anytime! People will notice the ruddy glow of health in your face, the sparkle in your clear eyes, your broad shoulders and they will seek your company. You will be the fellow who will walk off with the prettiest girl and the best job while the others wonder how you did it!

Write your name and address carefully on the coupon below. I'll send you absolutely free a copy of my new book, "*Everlasting Health and Strength.*" It reveals the secrets that changed me from a 97-pound flat-chested weakling into a husky fellow who won the title of "The World's Most Perfectly Developed Man" against all comers! And it shows how I can build you into an "Atlas Champion" the same way.

Are you underweight? I'll add pounds where they are needed! Are you fat in spots? I'll show you how to pare down to fighting trim.

And with the big muscles and powerful evenly-developed body that my method so quickly gives you, I'll also give you through-and-through health—health that digs down into your system and banishes such things as constipation, pimples, skin blotches and the hundred-and-one similar conditions that rob you of the good times and the good things of life.

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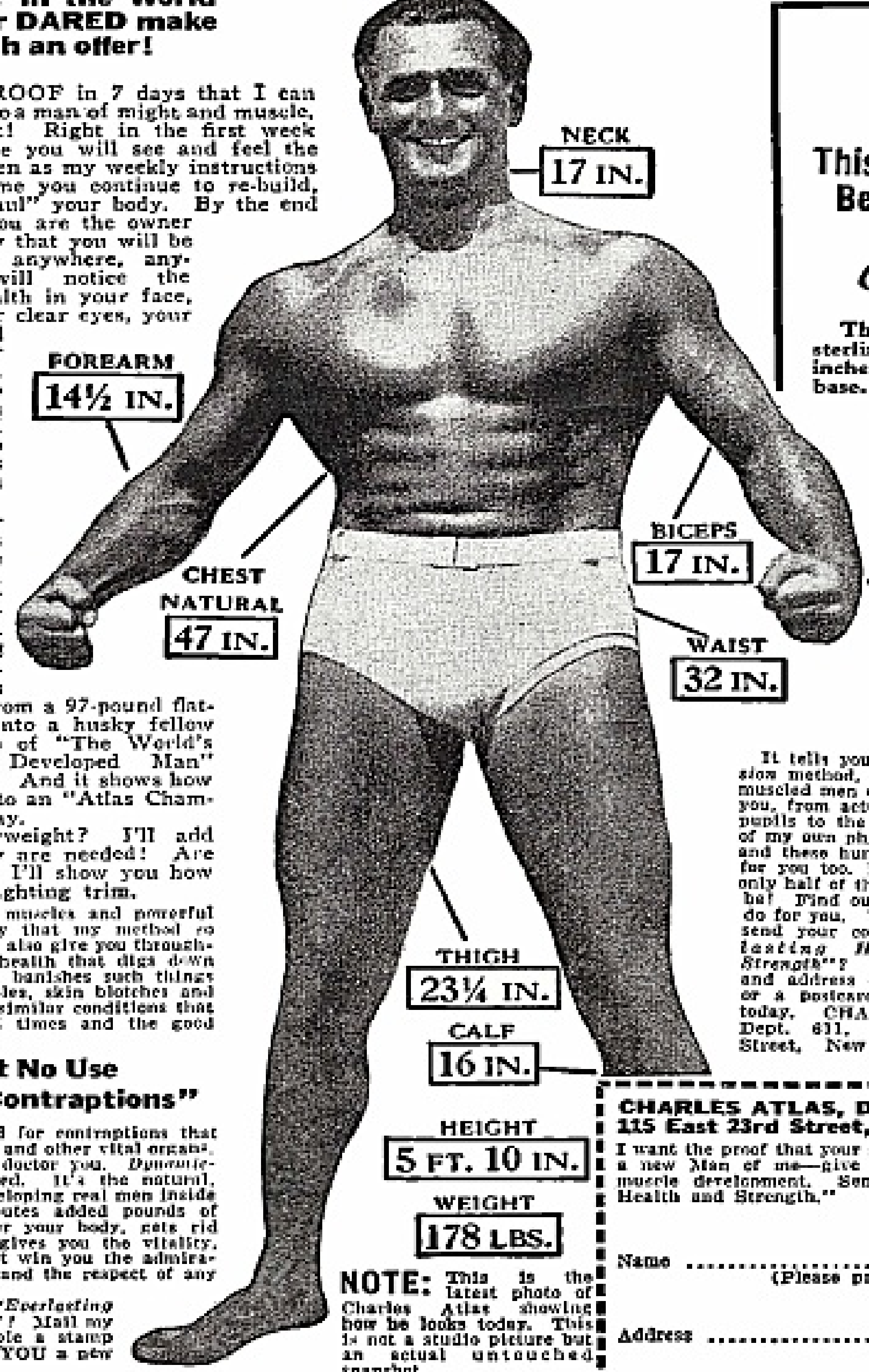
I haven't any need for contraptions that may strain your heart and other vital organs. I don't dose you or doctor you. *Dynamic-Tension* is all I need. It's the natural, tested method for developing real men inside and out. It distributes added pounds of powerful muscles over your body, gets rid of surplus fat, and gives you the vitality, strength and pep that win you the admiration of every woman and the respect of any man.

Get my free book, "*Everlasting Health and Strength*"! Mail my coupon today. Gamble a stamp to prove I can make YOU a new man!



NOTE: This is the latest photo of Charles Atlas showing how he looks today. This is not a studio picture but an actual untouched snapshot.

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This Sterling Silver Cup Being Given Away by

Charles Atlas

This valuable cup, made of solid sterling silver, stands about 14 inches high on a black mahogany base.

I will award it to my pupil who makes the most improvement on his development within the next three months. Therefore, no matter what your measurements may be now, you have an equal chance to win this cup for permanent possession — and with YOUR name engraved on it!

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It tells you all about my special *Dynamic-Tension* method, and what it has done to make big-muscled men out of run-down specimens. It shows you, from actual photos, how I have developed my pupils to the same perfectly balanced proportions of my own physique. What my system did for me and these hundreds of others it can do for you too. Don't keep on being only half of the man you CAN be! Find out what I can do for you. Where shall I send your copy of "*Everlasting Health and Strength*"? Put your name and address on the coupon, or a postcard, and mail it today. CHARLES ATLAS, Dept. 611, 115 East 23rd Street, New York, N. Y.

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I want the proof that your system of Dynamic-Tension will make a new Man of me—give me a healthy, husky body and big muscle development. Send me your free book, "Everlasting Health and Strength."

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Problems Editor Answers Queries

[*Continued from page* 18]

Some persons, more sensitive than the average to electric shock, are killed by voltages supposed to be perfectly safe. In wet weather animals and human beings are better conductors of electricity, and may get more violent shocks than are expected.

TESTING OUTBOARD ENGINES

Will an outboard engine operate at the same speed in a small testing tank as it would in a lake, mounted on a boat?—J. M., Boston, Mass.

In a test tank, where there is no forward motion of the propeller as on a moving boat, the propeller churns rather than cuts through the water, doing more work and therefore running at a slower speed. Water forced back by the propeller travels around the tank to slap against the leading edge and further retard the propeller.

DEMAGNETIZING MAGNETS

We are having difficulty with tools and work which have been placed on a magnetic lathe chuck. Is there any simple way to remove the magnetism from these tools, to prevent them from gathering iron filings?—W. T., Brooklyn, N. Y.

A demagnetizing coil, operating from 110 volts a.c., is made by winding about 1000 turns of No. 24 or smaller insulated wire into a doughnut-shaped coil large enough to permit tools to be passed through. Connect the coil directly across the line, and pass the work slowly in and out of the coil a few times.

AUTO BATTERY TROUBLES

Why should one cell of an auto storage battery require more water than the other two?—R. F., St. Bernard, Ohio.

That cell is heating excessively and evaporating the water at a higher rate than in the other cells. The trouble is very likely a partial short circuit, caused either by warping of the plates in that cell, by breakdown of the insulation between the plates, or by sediment piled up so high at the bottom of the jar that it bridges across two plates. Where the battery has already outlived the guarantee period, it is better to purchase a new battery than to have the one bad cell rebuilt. Draining all acid from the cell and rinsing thoroughly with pure water many times to remove the sediment at the bottom will sometimes clear the trouble.

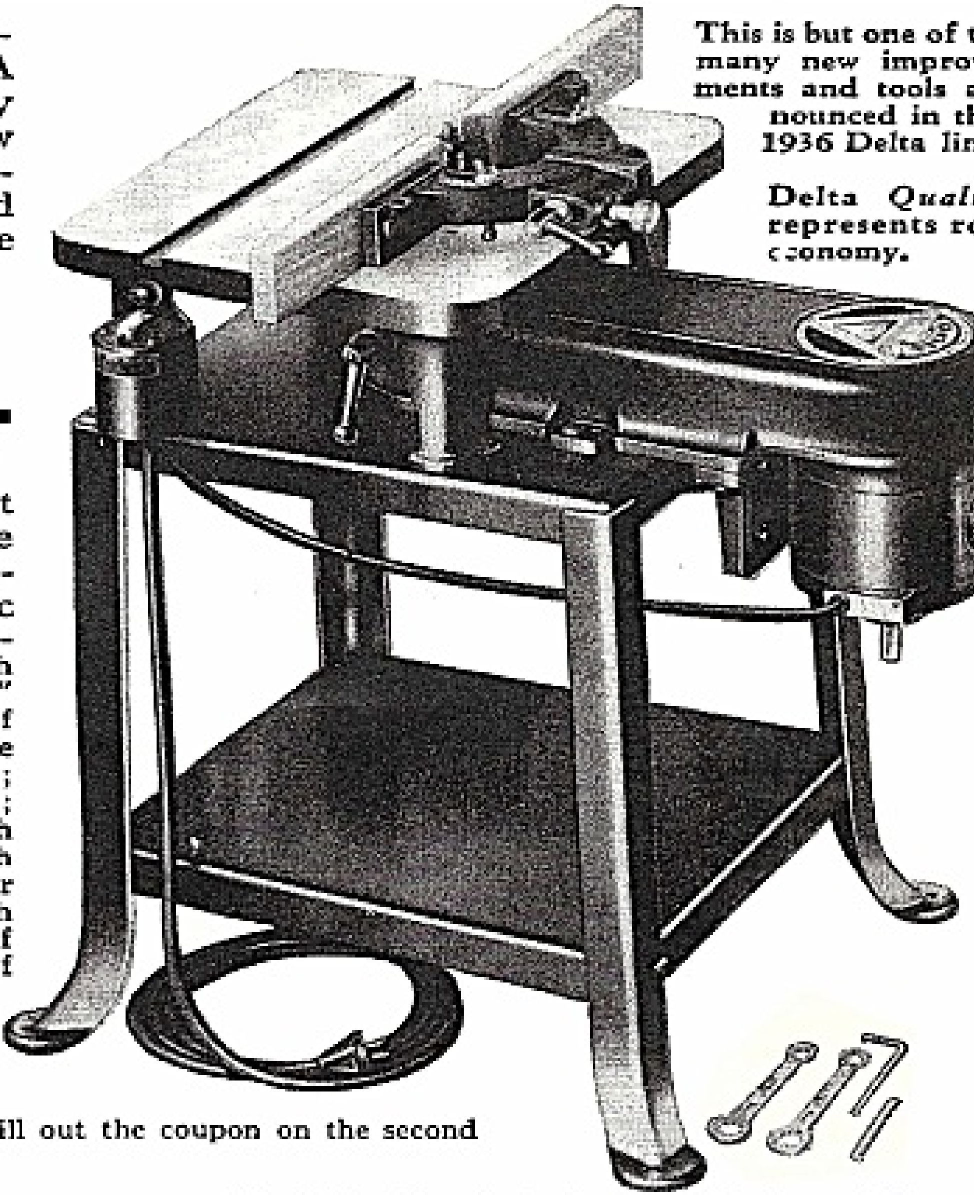
(Editor's Note: Your questions on any problem will be answered personally and free of charge by MM experts if a stamped addressed envelope or reply card is enclosed. Address Problems Editor, Modern Mechanix Publishing Co., Minneapolis, Minn.)

"Delta" ANNOUNCES

Important new tools and new improvements in the complete DELTA line for 1935-36 are announced by Delta engineers. As usual, these new tools embody great efficiency, skillful design, quality construction and materials—at remarkably low price levels!

This is but one of the many new improvements and tools announced in the 1936 Delta line!

Delta *Quality* represents real economy.

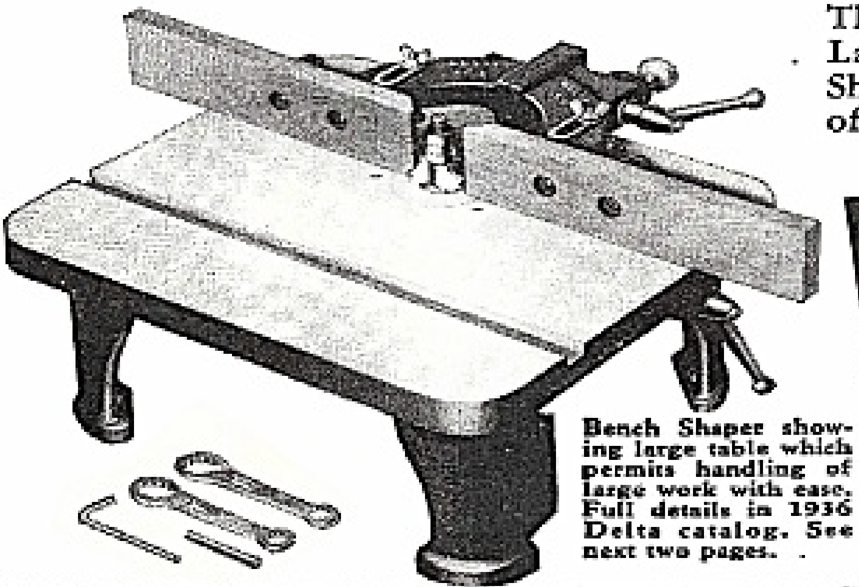


New Delta SHAPER UNIT

here illustrated is one of the simplest and at the same time most complete Shapers ever designed for the workshop. Some of its important basic features are: **1.** Extra Large Table permitting the handling of large work with ease; **2.** Interchangeable Spindles for 5/16" and ½" hole cutters for various types of work; **3.** Improved Completely Adjustable Fence for all varieties of straight work; starting pin for curved work of all kinds; **4.** Complete Guarding system; **5.** High Speed of 10,000 R. P. M. which with standard 3-lip Delta cutter gives over 30,000 cuts a minute, thus insuring smooth and finished work; **6.** Complete range of cabinet and sash cutters for all types of mill work.

For full details and description of this unusual tool together with illustrations of large variety of work that can be done with it, send for the new 1936 Delta Catalog. Fill out the coupon on the second page following this and mail it today!

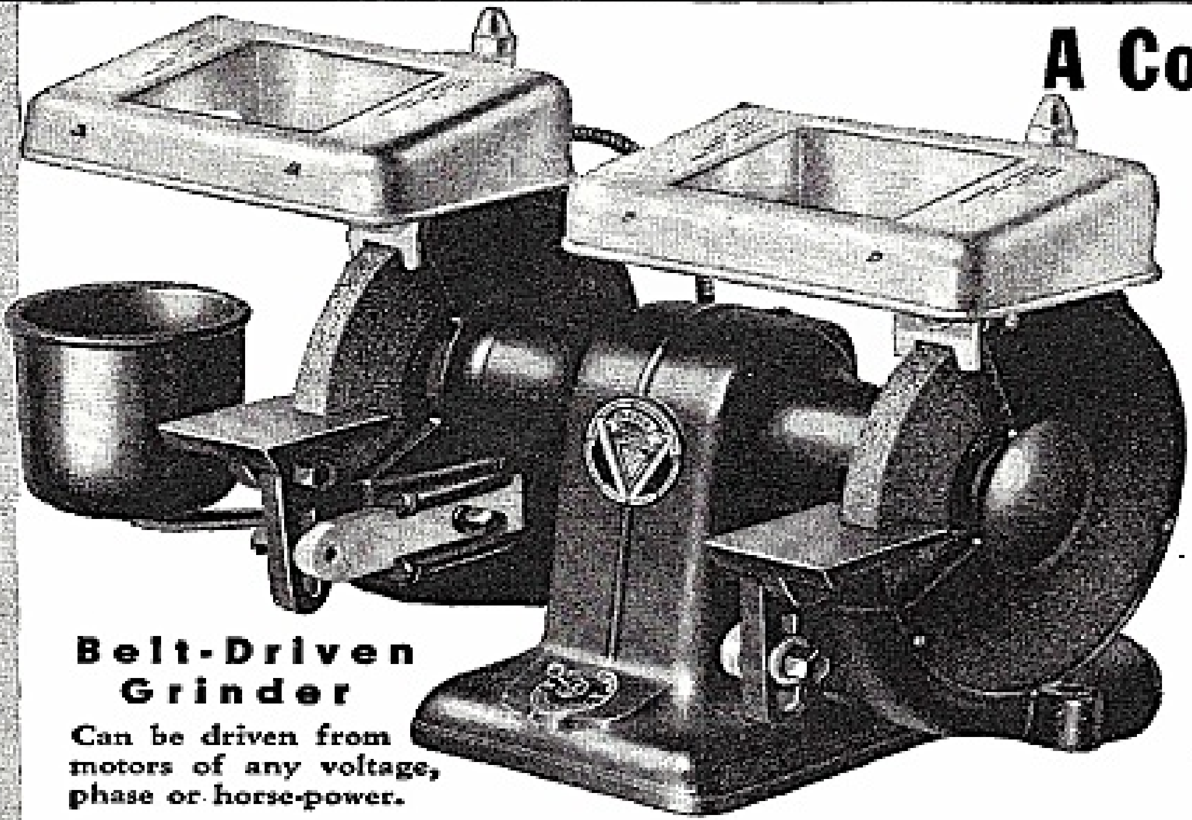
The Delta line includes Circular Saws, Jointers, Lathes, Scroll Saws, Band Saws, Routers, Shapers, Grinders and a complete assortment of attachments and accessories.



Bench Shaper showing large table which permits handling of large work with ease. Full details in 1936 Delta catalog. See next two pages.

See Next 2 Pages for Important Delta Announcements

New 1936 TOOLS



Belt-Driven Grinder

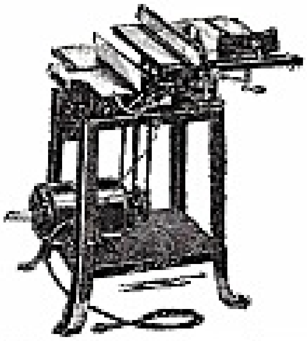
Can be driven from motors of any voltage, phase or horse-power.

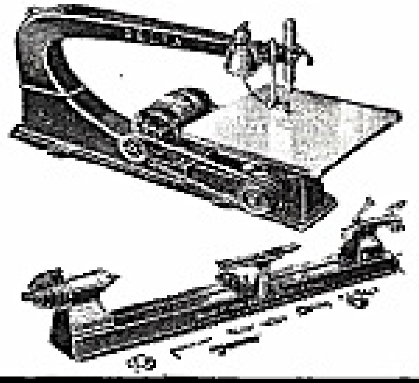
A Complete Line of NEW GRINDERS

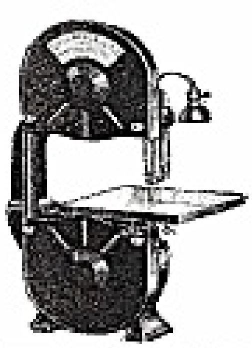
Not just another line of grinders—but revolutionary *new* grinders in every sense of the word! Belt-driven, motor-driven and pedestal models—they all embody Delta's high standards of design and construction. No pains have been spared to make these new Delta Tools *ideal* in every way—convenient, safe, accurate and efficient—truly, here are the grinders that shopworkers have always wanted—and at the unusually moderate Delta price levels.

Setting New Standards of Grinder Efficiency

These "Triple-Duty" machines embody numerous features that make them the most efficient grinders ever developed. These features include: **1.** Balanced Wheels to insure true running and absence of vibration; **2.** Maximum room on all models to permit operator to swing work around wheels; **3.** New Departure self-sealed ball-bearings; **No oiling needed for life of bearings; 4.** Very efficient wheel guards, complying with all safety codes; **5.** Convenient built-in switches on all models; **6.** Fully adjustable and instantly removable tool rest; **7.** Water pots on all models, combination tool tray and water-pot holder on all pedestal models; **8.** New Combination Lamp attachment and Spark Guard assuring maximum illumination and complete safety from sparks; **9.** A complete range of models in bench, pedestal and belt-driven types. For further details and complete information about Delta Grinders and all other Delta "Quality" Tools write for catalog!







Delta QUALITY represents real ECONOMY

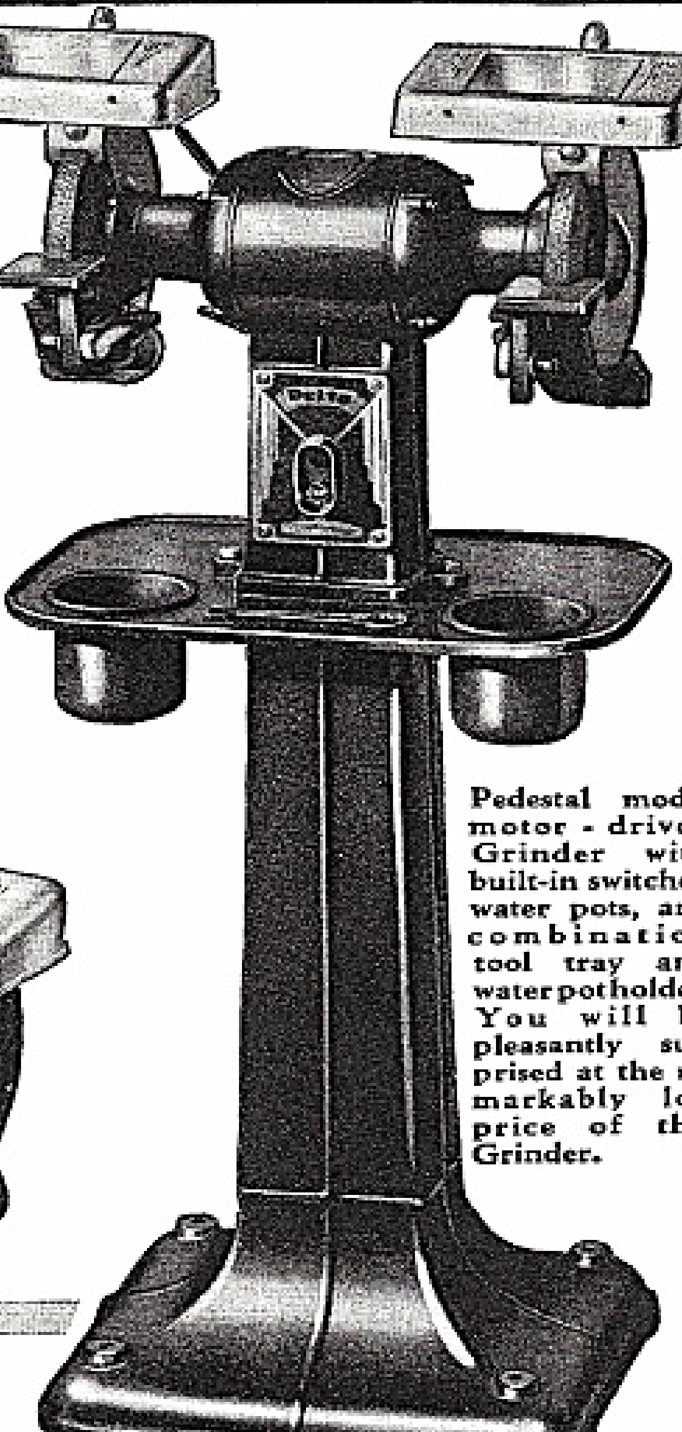
By "DELTA"...

If you are at all interested in motor-driven tools for use in home workshops, factories, farms, construction work, or small shops, be sure to see the new 1936 Delta line. The efficient performance, rugged precision construction, and fine workmanship of these compact economical tools are a revelation. You will understand then why Delta tools are used and recommended by tens of thousands workshop owners all over the world.

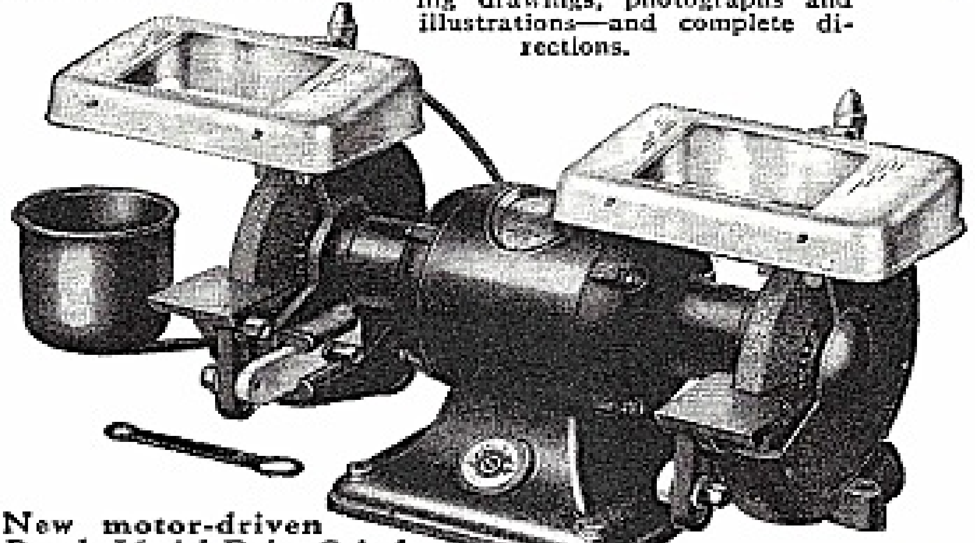
Write for Latest CATALOG

It is crowded with photographs and information about the new line of 1936 Delta tools. It contains much valuable information that every man interested in wood-working tools should have. It shows how Delta tools are built to stand the grind of production work, and yet are so low priced as to be within the reach of all, how they save time, money and labor—and quickly pay for themselves.

Mail coupon without delay. Enclose only 10 cents at same time for Book of Practical Delta Projects, 32 pages of new and novel things to make, with numerous blue prints, working drawings, photographs and illustrations—and complete directions.



Pedestal model motor - driven Grinder with built-in switches, water pots, and combination tool tray and water pot holder. You will be pleasantly surprised at the remarkably low price of this Grinder.



New motor-driven Bench Model Delta Grinder.

New 1936 Project Book

32 page book "Practical Delta Projects"—crowded with new and "out of the ordinary" things to make—with numerous working drawings, photographs and easy-to-understand illustrations. Simple, complete instructions make every project easy to follow. Every woodworker should have this book. Send only 10 cents with coupon. Book and 1936 Delta catalog will be mailed postpaid.

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MILWAUKEE, WISCONSIN

I enclose 10c (stamps or coin), for which please send me one copy of "Practical Delta Projects". Also place me on your mailing list to receive 1936 Delta catalog of quality motor-driven wood-working tools.

Name..

Address...Age....................

City..

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☐ Check here if you are a Delta user now.

Random Chips from

WE VENTURE to guess that you will remember this issue for years. It may be the means of bringing you a cash prize of $750.00 in MM's $1,750.00 contest. Here is a contest in which everybody has a chance to win a prize. Better start work on it now. Then there's "Tiny Tom," the finest model locomotive in 00 gauge we've seen in a long time. By getting the blueprints now you can have the entire railroad built before Christmas.

With football in the air everywhere we offer you a choice selection in Bernie Bierman's own words. And Jimmie Doolittle answers timely questions on aviation. But we'd better not go on. After all half the fun of reading MM is browsing through it to see what it has to offer.

Who will be the lucky winner of $750 in cash, first prize in MM's big $1,750.00 contest? Start unscrambling photos now.

****

The Workbench's own contest seems rather small compared to that $1,750.00 in cold cash being offered on page 42. But don't stop sending in your photos. There is no reason why you can not win prizes in both contests.

This month's first prize goes to the unusual self-portrait of Walter Craig taken while flying in his glider hundreds of feet in the air. He says:

Here is Walter Craig flying high above Alabama in his glider. His hand pulled a string that tripped the shutter. His photo was awarded the first prize of $5.00 this month.

Selma, Ala.

Dear Editor:

Enclosed please find picture of me and my hobby—gliding. The picture was taken as I soared many hundred feet in the air. The camera was tied to a wing of the glider and snapped by means of a string attached to it.

Walter Craig.

****

That won $5.00 and second prize of $3.00 went to another MM midget car:

Omaha, Neb.

Dear Editor:

I am sending photos of a midget car built by my Dad and me from your magazine. It has a ¾ h.p. motor and can do about 20 m.p.h.

The motor starts with a rope like an outboard motor. It is very easy on gas since I get about 60 to 70 miles on a gallon. The "free action" wheels help a great deal when the wheels hit stones or when the car goes over the curb.

Grant Keller.

Blueprints for this midget automobile with free action wheels can be obtained from MM for 25 cents.

****

Third prize of $2.00 was awarded to Myrl Lemley for his photo and this letter:

Route 1, Brighton, Iowa.

Dear Editor:

The photo shows the one-tube transmitter described in your July issue. I used plug-in coils, however, to make it easier to shift wave bands. In the same case I have a one-tube receiver, making a transceiver outfit which is portable. The microphone in the photo is also homemade.

the Editor's Workbench

The junior operator in the photo, Mary Jane Lemley, we think is the youngest radio "bug." She is 22 months old, talks over this transmitter and operates the receiver also. We have two of these outfits and use them to carry on conversations from two points without aerials.

Myrl O. Lemley.

Lemley would like to hear from readers who have built 6-volt wind power battery charges. He also built MM's arc welder, mounted it on a trailer with a Ford T motor, and declares it is a fine outfit.

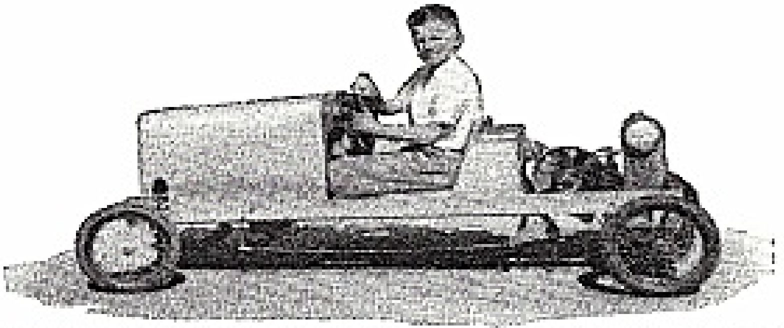
****

Before leaving the subject of our monthly contests, we want to announce a slight change in the rules. We will continue to award the three prizes each month to the best photos of and letters about things built by our readers. However, to qualify, each entry in these contests must state in his letter the article or department he likes best and the article or department he likes least in the current issue of MM. You don't have to say why you like or dislike an article or department; simply name the one you like and the one that did not "click" with you. We hope to announce the first winners under these rules in the January issue. Send your photos in now!

****

If any of you are building the gas-powered model plane in the August and September issue, don't let the drawing of the lower wing panel confuse you. The scale is correct but the overall length of the wing is 25$\frac{1}{16}$ inches or 31$\frac{3}{16}$ inches if two sections are added.

****



MM's "free action" midget car in action. Built by Grant Keller and his father, it took the second prize of $3.00.

Lionel George has this to say about the "power takeoff," described in the November, 1934, issue:

Dunstable, Alta.

Dear Editor:

The "power takeoff" the plans for which appeared in your magazine is standing up and performs perfectly. We use it in crushing grain and sawing cordwood.

Lionel George.

[*Continued on page 26*]

MM's Author of the Month

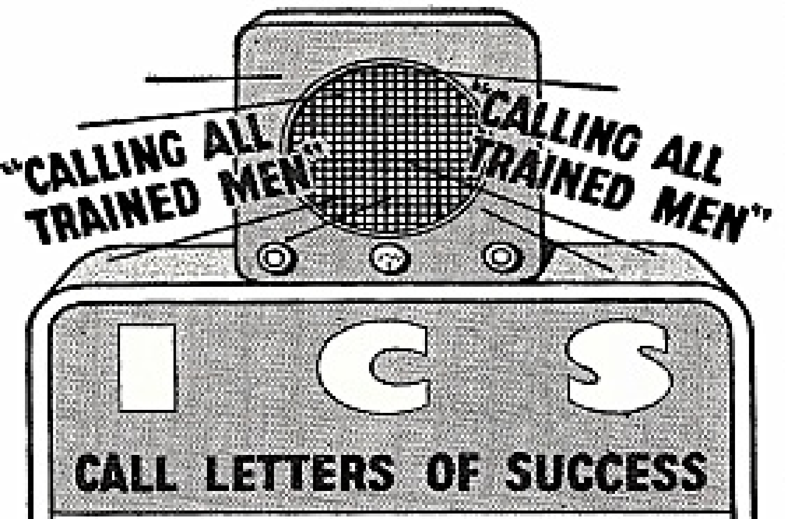
The author who contributes to each issue of MM an article for amateur microscopists is Dr. Julian Dana Corrington of Rochester, New York. In his spare time he also submits articles on this subject regularly to several scientific magazines and has written a book for the Bausch and Lomb Optical Company, "Adventures With the Microscope."

His regular duties for Ward's Natural Science Establishment, Inc., include head of the microscope slide department, editor of publications, and in charge of educational service. A number of scientific papers on anatomy and field zoology comprise his other writings.

Dr. Julian D. Corrington.

Before coming to Ward's in 1931, Dr. Corrington was for ten years professor of biology or zoology at the University of South Carolina, Syracuse University, and Drew University. He graduated from Blees Military Academy, Macon, Missouri, in 1909, and from Cornell University in 1913, subsequently touring Europe on foot, serving during 1918 as a Second Lieutenant in the Air Service, U. S. A., and obtaining his Ph. D. in zoology from Cornell in 1925. He is a Fellow of the American Association for the Advancement of Science and a member of Sigma Xi and Phi Beta Kappa.

Dr. Corrington is 43 years old, is married and has a daughter of 18 and a boy of 9. He was born in Hot Springs, Ark., December 22, 1891. His wife, formerly Veronica Flicke of Brooklyn, N. Y., is an artist. She executes all of the drawings for his articles and books, as well as contributing her work to other publications.



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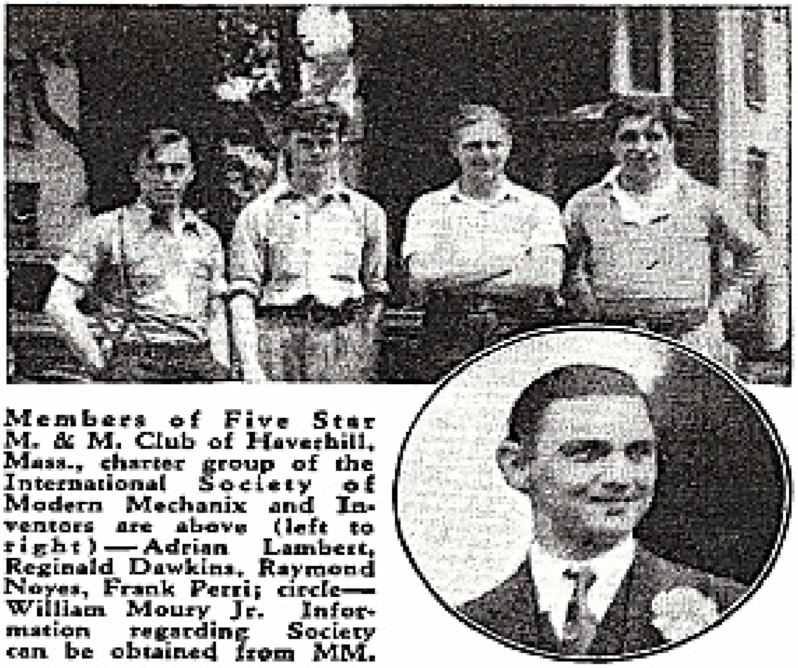
Chips from the Editor's Workbench

[*Continued from page 25*]



Members of Five Star M. & M. Club of Haverhill, Mass., charter group of the International Society of Modern Mechanix and Inventors are above (left to right)—Adrian Lambert, Reginald Dawkins, Raymond Noyes, Frank Perri; circle—William Moury Jr. Information regarding Society can be obtained from MM.

Stray chips: From Herman de Neui, of Wellsburg, Iowa: As a wood worker I would like to see more plans for woodworking projects in your magazine. From Robert F. Helliwell, of Rose Bay, Sidney, Australia: I am an ardent fisherman and I am very interested in Mr. Lincoln's articles, even though they differ so much from the Australian methods. I have wondered what sort of ocean, salt water, and rock fishing you have around your coasts. Do you think it is possible to publish such an article? From Jackson A. Young, Barberton, Ohio: I have all the copies of MM from November, 1928, to the present date and all of the Flying Manuals. From W. K. Broughton, Miami, Fla.: I am very interested in diving and think it would be a great idea to start a national diving club. What do the rest of MM readers think about it? From Edward A. Jaksa, of Council Bluffs, Iowa: I made some of the crystals described in the Radio Builders' Manual. Using these crystals I picked up programs from KOA, Denver, approximately 500 miles away. We'll say "thirty" with this: Who will be the first to send in a photo of his "Tiny Tom" locomotive and win a Workbench prize?

Myrl Lemley, who won third prize of $2.00, believes 22-month-old Mary Jane is the world's youngest radio bug.

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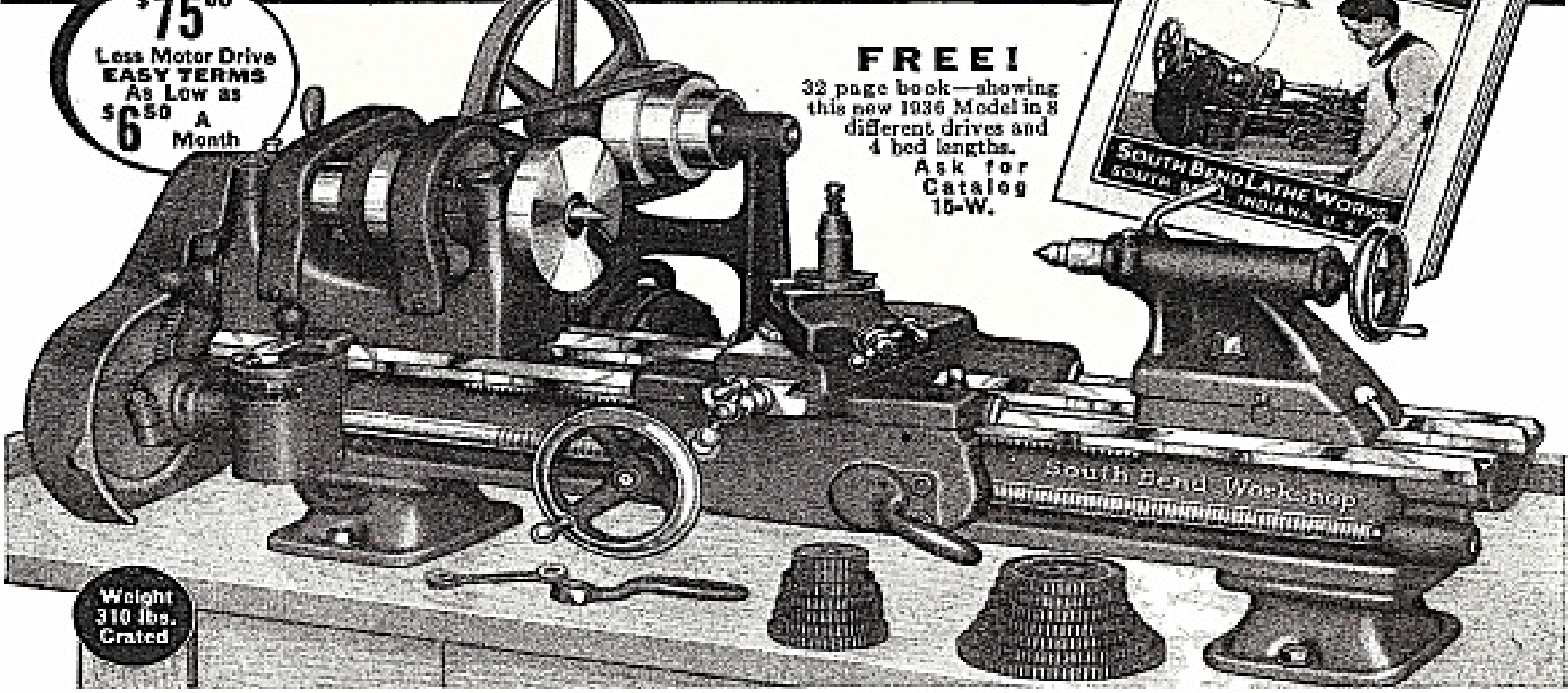

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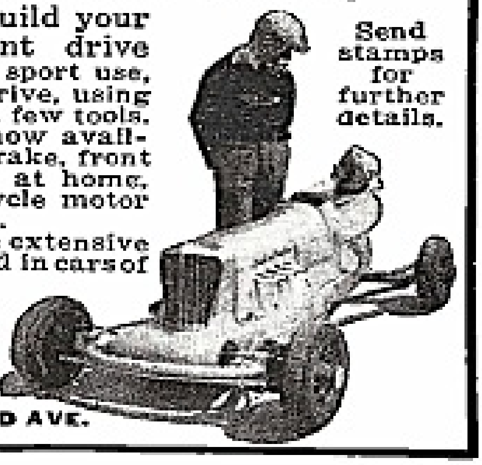

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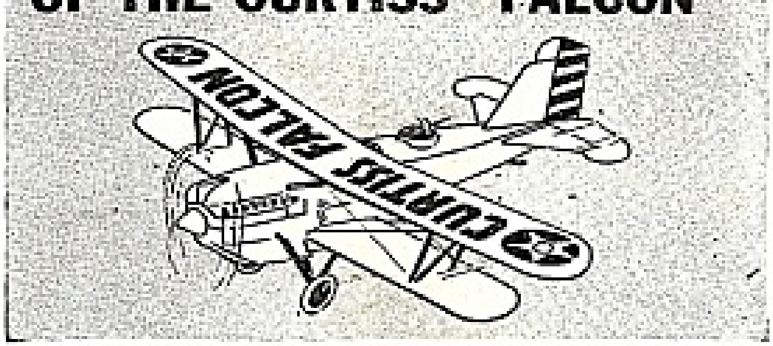

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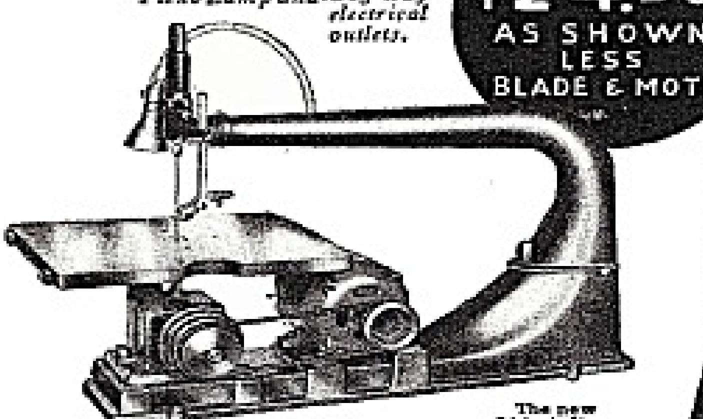

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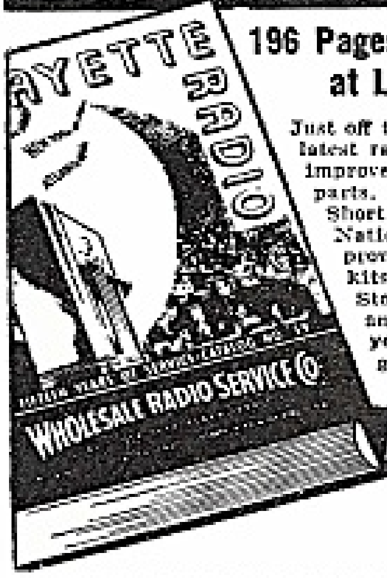

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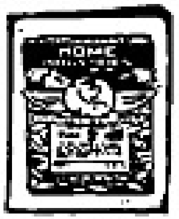

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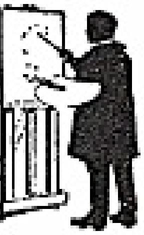

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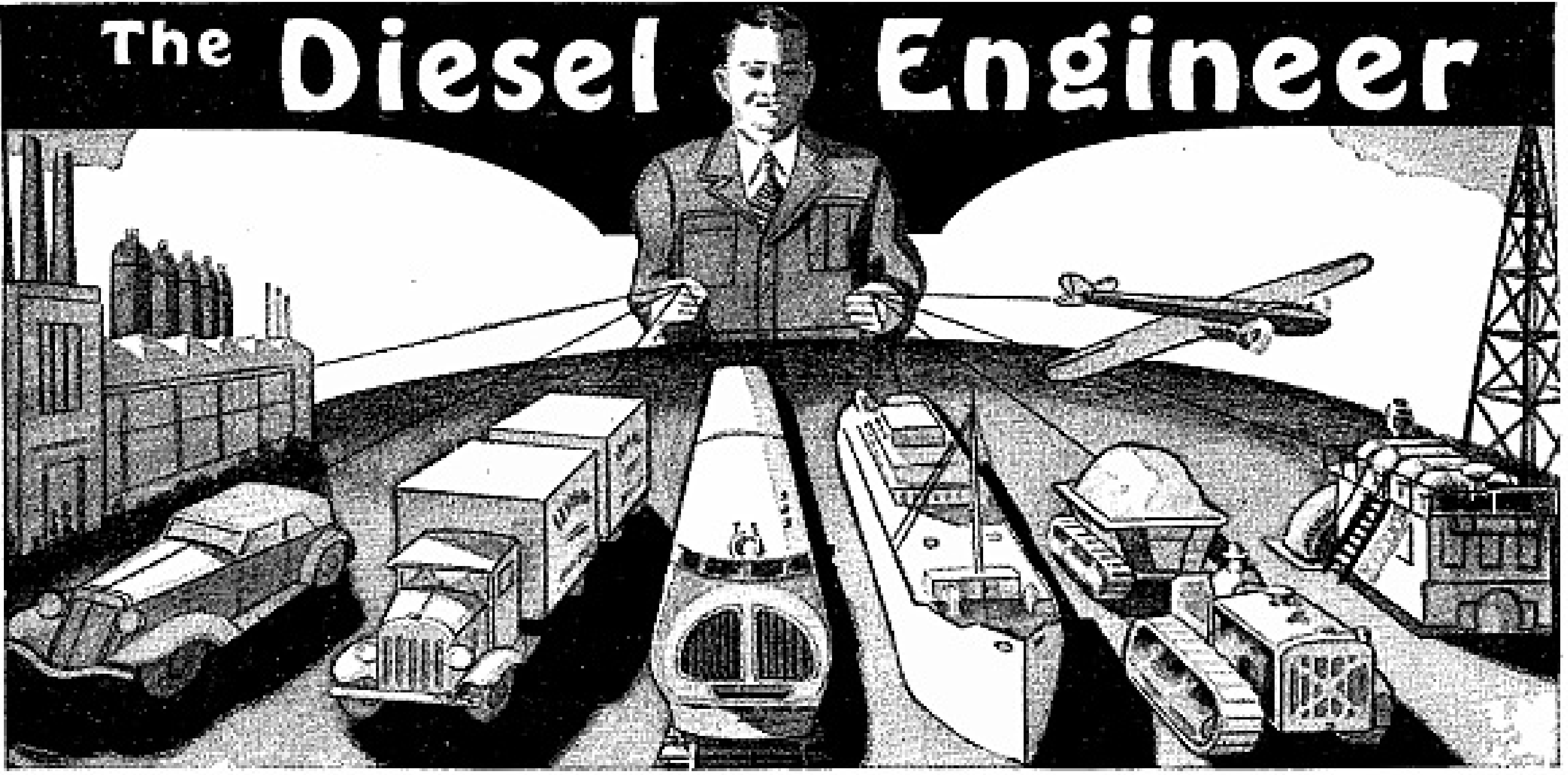
The Diesel Engineer



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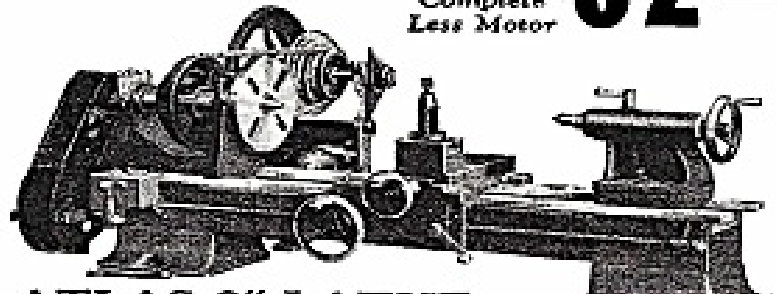

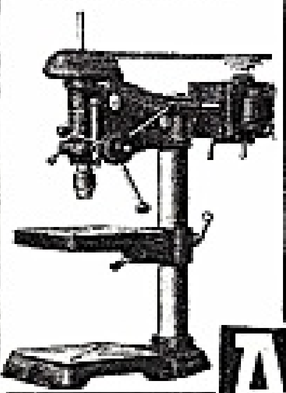

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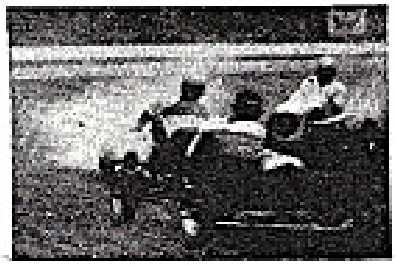

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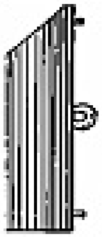

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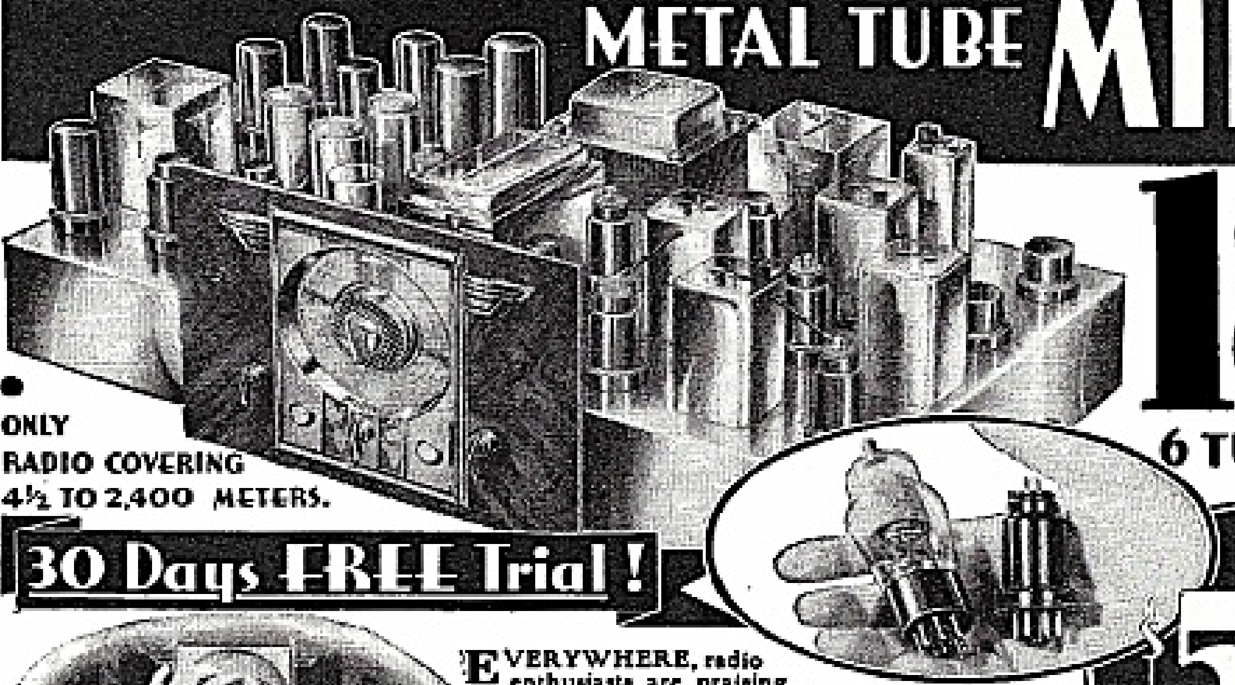

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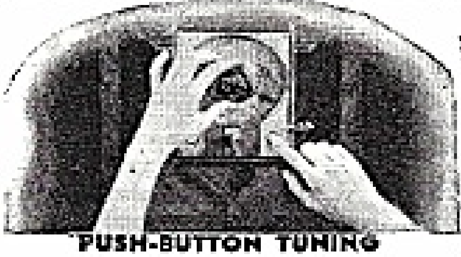

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Now, Push-Button Silent Tuning is offered for first time! Simply pushing Silencer Button hushes set between stations .... suppresses noises. Pressing Station Finder Button automatically indicates proper dial position for bringing in extremely weak stations.

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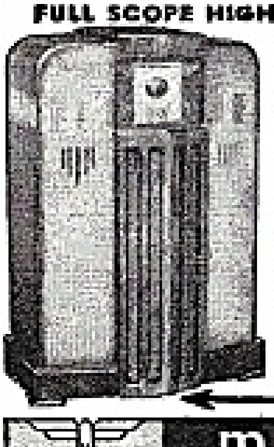
...Establishes new radio style overnight! The V-Front Dispersing Vanes were developed by Midwest engineers as a result of a study of directional effect of the Midwest Full Scope High Fidelity Speaker. These Vanes spread the beautiful lacework of the "highs" throughout the entire room in a scientific manner... directing the High Fidelity waves uniformly to the ear. Send for new FREE 40-page catalog. It pictures the complete line of beautiful 1936 Acousti-Tone V-Spread consoles . . . and chassis . . . in four colors.

FULL SCOPE HIGH FIDELITY Brilliant Concert Tone



Now, get complete range of audible frequencies from 30 to 16,000 cycles, being transmitted by four new High Fidelity Broadcasting stations—W1XBS, W9XBY, W2XR and W6XAL. Glorious new Acousti-tone is achieved . . . assuring life-like, crystal-clear "concert" realism.

V-FRONT

EVERYWHERE, radio enthusiasts are praising this amazingly beautiful, bigger, better, more powerful, super selective, 18-tube 6-tuning range radio. They say it is a tremendous improvement over Midwest's 16-tube set, so popular last season. It is sold direct to you from Midwest Laboratories at a positive saving of 30% to 50%. (This statement has been verified by a Certified Public Accountant who conducted an impartial survey among representative Ohio, Kentucky and Indiana raido retailers.) Before you buy any radio, write for FREE 40-page 1936 catalog. Never before so much radio for so little money. Why pay more? You are triple-protected with: One Year Guarantee, Foreign Reception Guarantee and Money-Back Guarantee!

This super Midwest will out-perform $200 to $600 sets on a point-for-point comparison. That is why nationally known orchestra leaders like Fred Waring, George Olsen, Jack Denny, Ted Fio Rito, and others use Midwest sets to study types of harmony and rhythmic beats followed by leading American and Foreign orchestras.

80 ADVANCED 1936 FEATURES

Scores of marvelous features, many exclusive, explain Midwest super performance and thrilling world-wide all-wave reception . . . enable Midwest to bring in weak distant foreign stations, with full loud speaker volume, on channels adjacent to locals. Only Midwest offers so many features . . . only Midwest tunes as low as 4½ meters . . . only Midwest gives the sensational new Push-Button Tuning feature, etc. See pages 12 to 21 in FREE catalog for description of the 80 features. Read about advantages of 6 Tuning ranges . . . offered for first time: E, A, L, M, H and U. They make this Super De Luxe 18-tube set the equivalent of six different radios . . . offer tuning ranges not obtainable in other radios at any price!

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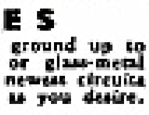
SAVE UP TO 50%

No middlemen's profits to pay — you buy at wholesale price direct from laboratories ...saving 30% to 50%. Increasing costs are sure to result in higher radio prices soon. Buy before the big advance . . . NOW . . . while you can take advantage of Midwest's sensational values. You can order your Midwest 1936 Full Scope High Fidelity Acousti-Tone radio from the 40-page catalog with as much certainty of satisfaction as if you were to come yourself to our great radio laboratories. You save 30% to 50% . . . you get 30 days FREE trial . . . as little as $5.00 puts a Midwest radio in your home . . . Satisfaction guaranteed or money back. Write today, for FREE catalog.

Thrill to new explorations in sections of radio spectrum that are strangers to you. Every type of broadcast from North and South America, Europe, Asia, Africa and Australia is now yours. Send today for money-saving facts.

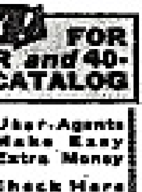
GEORGE OLSEN PRAISES LIFE-LIKE TONE REALISM



Long Island, N. Y.—After comparing many different makes, I finally decided upon Midwest. It out-performs other radios costing almost twice as much. The crystal-clear tone is so life-like that it sounds as though I am in the studios, actually hearing artists performing.

George Olsen

TODAY'S FINEST RADIO SAYS TED FIO RITO



My new Midwest is finest radio I have had pleasure of hearing. Bass-Treble control is marvelous . . . enables one to hear every instrument in orchestra.

Ted Fio Rito

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This Midwest is engineered from the ground up to use either the new METAL tubes or glass-metal counterpart tubes. Octal sockets and newest circuits permit use of either type . . . just as you desire.

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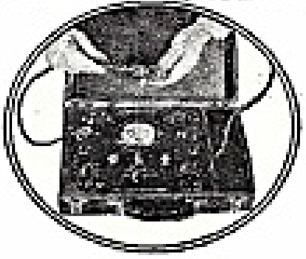
I started a radio shop handling all kinds of radios and electric equipment. Since starting this shop, I have been able to earn from $2 to $6 an hour. I have built up a good reputation from sales and service work. These satisfied customers have referred their friends to me and as a result I have all the business I can handle. R. T. A. sure opened my eyes to big money and I want to thank you for all you have done for me. My income is more than doubled what it was at the time I enrolled and I expect to earn still more.
Ernest Lanctot



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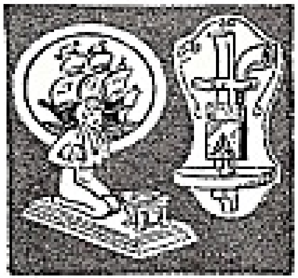

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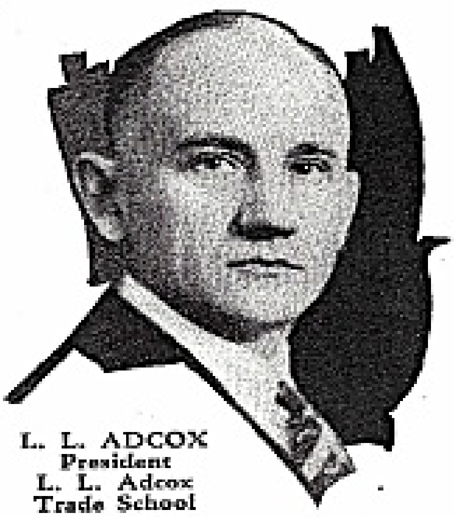

L. L. ADCOX
President
L. L. Adcox
Trade School

I'll help YOU get a big-pay job in DIESEL

I think I know you. Impossible, you say? Well, I don't know the color of your eyes or how much you weigh or even your age (it might be anywhere from 15 to 50). But I do know something lots more important about you. I know what has been going on in your mind for the last few years.

You've been doing some tall thinking. You made up your mind some time ago that never, NEVER again would you and those you hold dear to you suffer through another depression like this last one. You determined to have a good job next time. And money in the bank.

You haven't started yet—Why?

I'll tell you that, too. You don't know for sure just what line to get into. And perhaps you feel you haven't quite enough money to finance your start. Listen to me a minute. I have been helping fellows into big pay jobs with success, independence and happiness assured, for the past 26 years. Now I am giving my boys and men complete courses in Diesel Engineering, making the highest type of Diesel Experts out of them. You know without me telling you, how the Diesel industry has been making its greatest progress during the depression—that it has been revolutionizing scores of other industries and now stands on the threshold of an amazing development. Diesel Experts certainly will be sitting on top of the world.

$300.00 JOBS

Jerry Palmer

Jerry wrote me recently: "My investment in time and money in the L. L. Adcox Trade School was returned to me in the first three months after my graduation. My position as Chief Diesel Engineer pays me $300.00 per month.

I'll help you get into this line—RIGHT

I'll give you the finest course in Diesel Engineering that money can buy, at a price that makes it the most profitable investment a fellow can make. Please don't feel that because the opportunities are almost endless in Diesel that you can get along with a cheap smattering of Diesel knowledge. Diesel wants men who *know how* and is willing to pay handsomely. If you are the clear headed fellow I think you are you'll want the SUPERIOR TRAINING my school can give you. You will be mightily interested in my 26-year-old reputation for making a high percentage of successes out of my graduates — you'll be interested in the fact that there is no better equipped Diesel school in the country—and in the fact that if you elect to come to the Adcox School I will help you finance your training period if you wish by helping you get a part time job to pay your room and board. I will help you all through your schooling backed by the friendliest, most capable staff you ever met.

Then I'll help you get that job!

You will study in the Pacific Northwest, a "hot spot" of Diesel activity and a most important center of Diesel employment. You will study right alongside the kind of job you want whether it's tractors, trains, trucks, Diesel driven tugs, fishing boats, freighters and ocean liners or any other of the endless uses of Diesel. You'll like the matchless climate of the Pacific Northwest. You'll enjoy the outdoor recreations for which this part of the country is famous.

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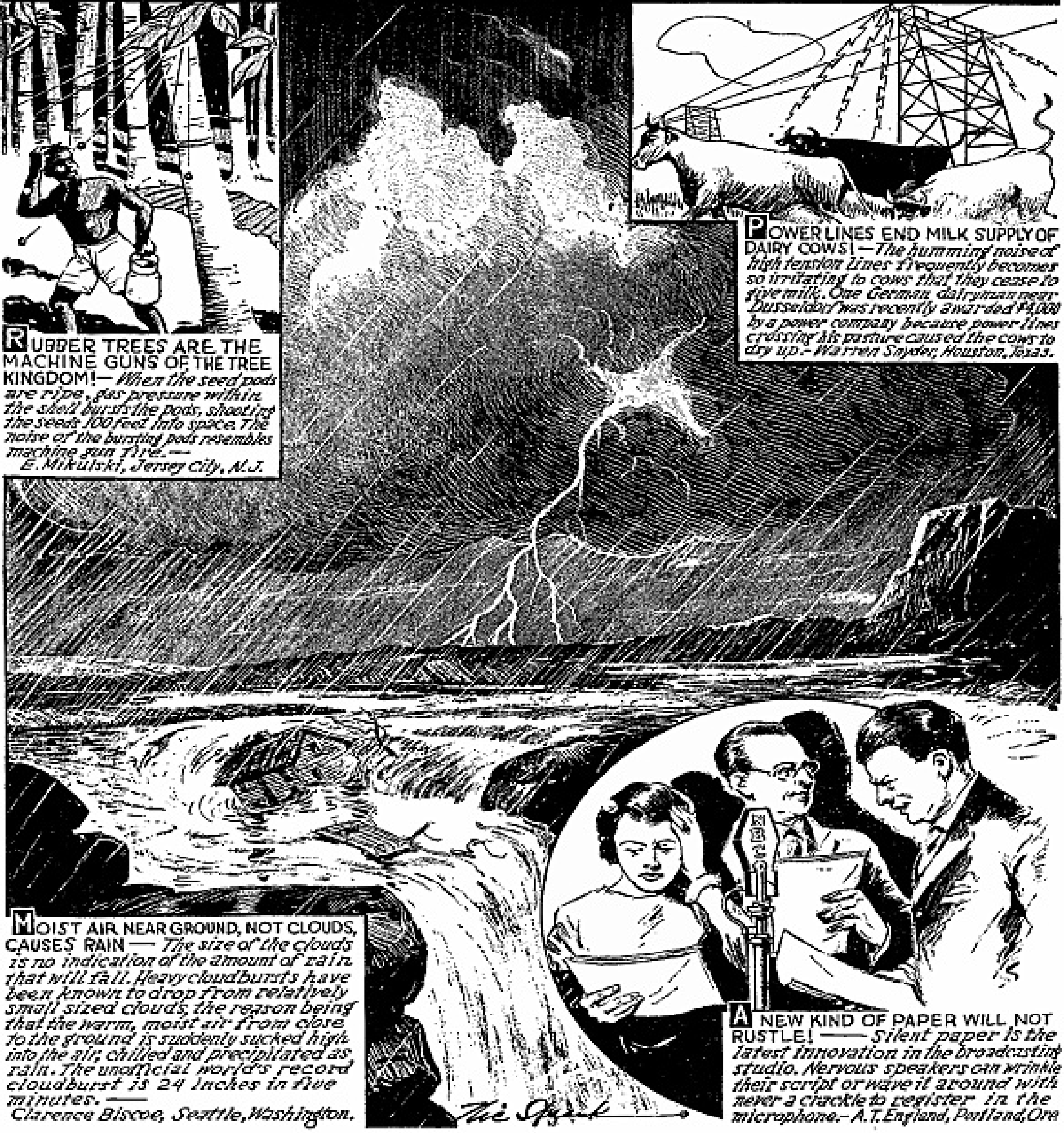
Small Clouds Can Make Big Cloudbursts

Says Nic Sprank In Oddities of Science



RUBBER TREES ARE THE MACHINE GUNS OF THE TREE KINGDOM!— *When the seed pods are ripe, gas pressure within the shell bursts the pods, shooting the seeds 100 feet into space. The noise of the bursting pods resembles machine gun fire.*— E. Mikulski, Jersey City, N.J.

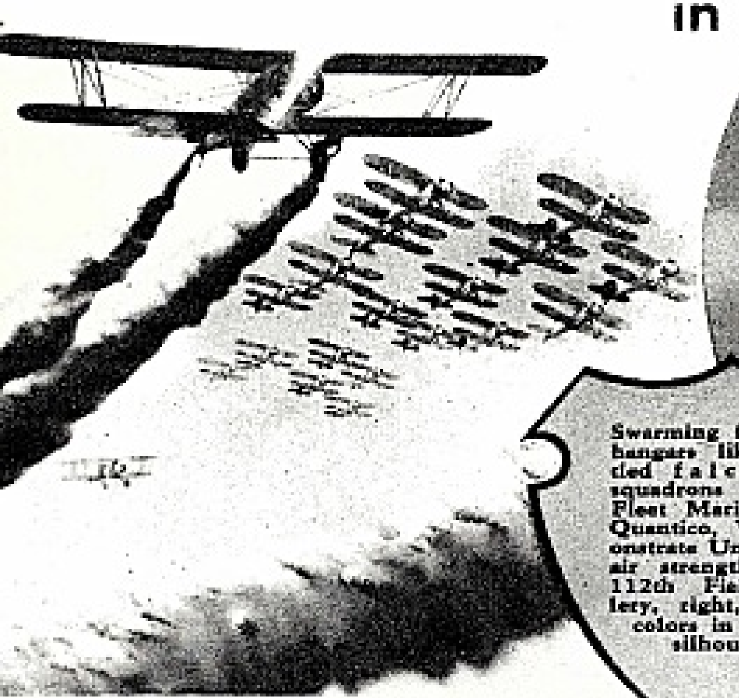
POWER LINES END MILK SUPPLY OF DAIRY COWS!— *The humming noise of high tension lines frequently becomes so irritating to cows that they cease to give milk. One German dairyman near Dusseldorf was recently awarded $4,000 by a power company because power lines crossing his pasture caused the cows to dry up.*- Warren Snyder, Houston, Texas.

MOIST AIR NEAR GROUND, NOT CLOUDS, CAUSES RAIN— *The size of the clouds is no indication of the amount of rain that will fall. Heavy cloudbursts have been known to drop from relatively small sized clouds, the reason being that the warm, moist air from close to the ground is suddenly sucked high into the air, chilled and precipitated as rain. The unofficial world's record cloudburst is 24 inches in five minutes.*— Clarence Biscoe, Seattle, Washington.

A NEW KIND OF PAPER WILL NOT RUSTLE!— *Silent paper is the latest innovation in the broadcasting studio. Nervous speakers can wrinkle their script or wave it around with never a crackle to register in the microphone.*- A. T. England, Portland, Ore.

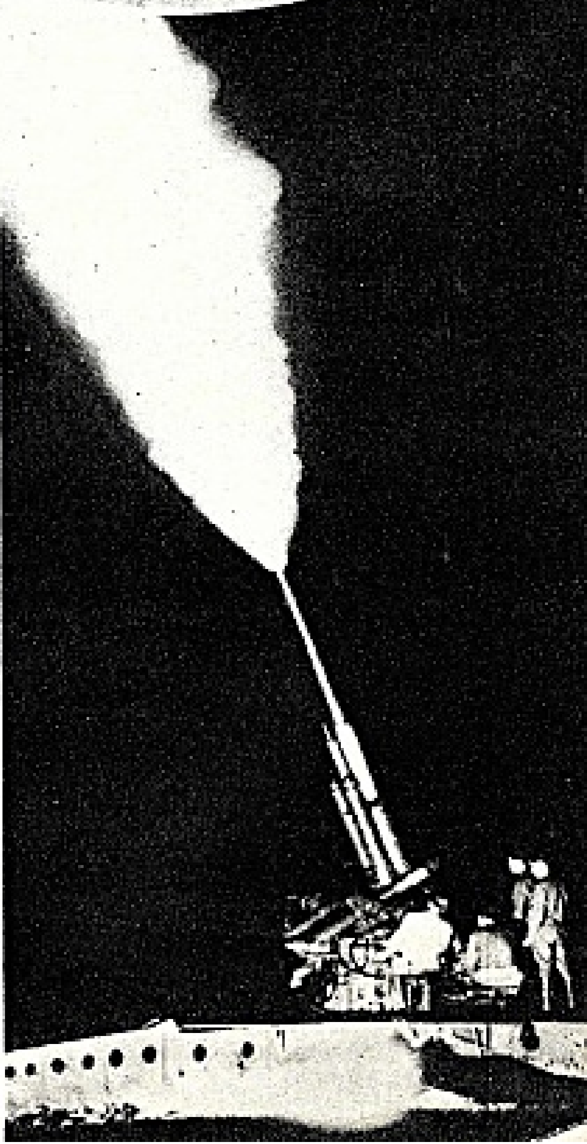
Win $1! Send your Oddity of Science to Nic Sprank, Modern Mechanix Publishing Company, Minneapolis, Minnesota. Source or proof of each Oddity must be given. Send all Oddities separately, not with other manuscripts or letters.

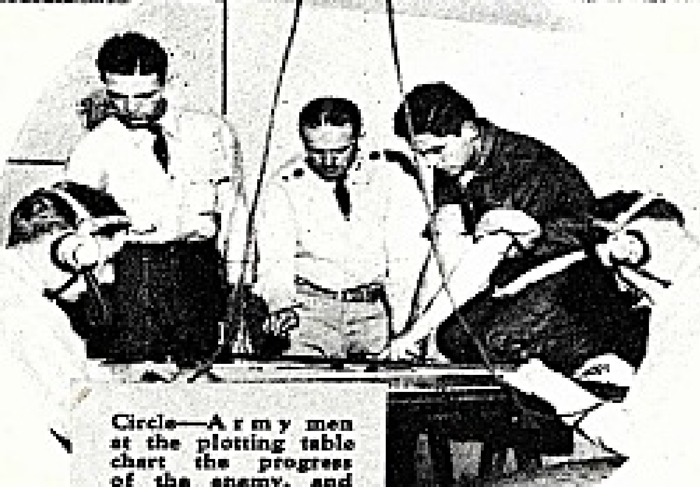
56,000 Battle in Greatest Peace "War"



Swarming from their hangars like embattled falcons, air squadrons of the Fleet Marine Force, Quantico, Va., demonstrate Uncle Sam's air strength as the 112th Field Artillery, right, displays colors in striking silhouette.

Fast tanks of the 76th Infantry lead the way over the top as 56,000 men in the "Red" and "Blue" armies clash in the greatest peace time "war" ever staged. Referees' scores replaced the casualty list in determining the winner as the battle raged on the Pine Camp, N. Y., front. Right—At night the horizon flashed with gun fire when giant anti-aircraft guns boomed defiance to hostile planes. All the latest mechanical "ears" and "eyes" were used in locating the elusive birdmen.





Circle—Army men at the plotting table chart the progress of the enemy, and prepare to lay down a barrage of shell fire as a welcome. Right—The signal corps of the 27th division arrives at Pine Camp to install field telephones and communication centers for the war.

Secrets of CHAMPIONSHIP

Behind the great football team which jammed the University of Minnesota Memorial Stadium, above, with howling spectators was the man at left, Head Coach Bernie Bierman.

I'LL take a quarterback, please—at least, I am willing to start with one. Call it what you will—a prayer, a theme song, a plank in a coach's platform—but there you have the hope eternal that springs in my heart.

Let them talk of systems—Notre Dame, Warner, Howard, Jones, Michigan—but you'll notice that when these or any other system is clicking there generally is a capable man directing field strategy.

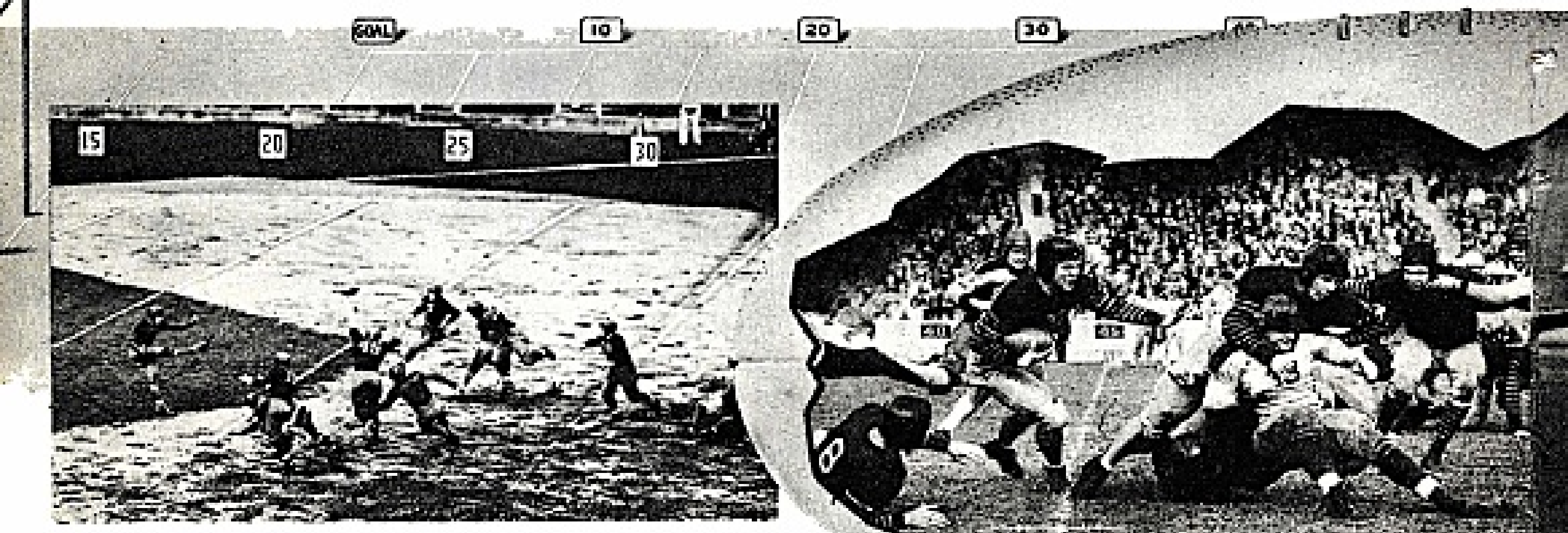
Mind, I said "capable." Great elevens have existed without great quarterbacks, but rarely without capable ones. On the other hand, great quarterbacks at times have lifted merely capable teams to dizzy heights.

Go through your record books and pick them out—Eckersall of Chicago, McGovern of Minnesota, Barret of Cornell, Dorais and Carideo of Notre Dame, Dawson of Tulane, and Warburton of U. S. C., to mention only a few—they all had it, that immortal fire that woos other men to rise beyond themselves in the heat of battle.

Step from the sidelines or the stands and run invisible at the elbow of such a lad, taking part in both his mental and physical processes, as he goes through a game.

Delving into his mind, we should learn that he knows instinctively what plays to call for at any point in the field as well as what plays to keep under cover. To him, "do not" in many cases looms up as more important than "do."

The forward pass, for instance. There's



In the danger zone, 30 yards from his own goal, Moynihan of Boston College punts on second down in the battle against Fordham. Right—In safer territory, Fred Blower, U. of C. opens up against the Olympic Club with a tricky end sweep from his 40 yard line.

By Bernie Bierman

FOOTBALL

Bernie Bierman, coach of the University of Minnesota's championship Gophers, takes you from the grandstand onto the gridiron in this thrilling article on championship football. You stand beside Bierman's quarterback, dissecting your foe's plays and planning new drives.

The football receives the kick-off, and "Pug" Lund, Coach Bierman's outstanding All-American star, receives the football. Pandemonium breaks loose, and the game is on.

a ticklish play, and you'll find he will never pass in his own territory early in the game with the score even. Neither will he risk losing the ball on a pass near his opponent's goal line while his running game is working, nor will he pass near the sidelines unless he has a specially worked out trick play up his sleeve.

He would never violate the cardinal rule of generalship that bans the pass when he is ahead late in the game. He knows that many a tight contest has turned from victory to defeat on the needless chance taken in such a situation.

And punting! His instinctive knowledge there is certain also. It's usually good policy to punt on first or second down within his own 15 yard line and on second or third down within his 30 yard line and usually on third down within the 40 yard line, you will learn as you watch him.

He knows it's safe to kick on fourth down only beyond the 40 yard line. The probability of a blocked kick increases with each succeeding down, he reasons, and it is anything but pleasant to have a blocked kick in dangerous territory.

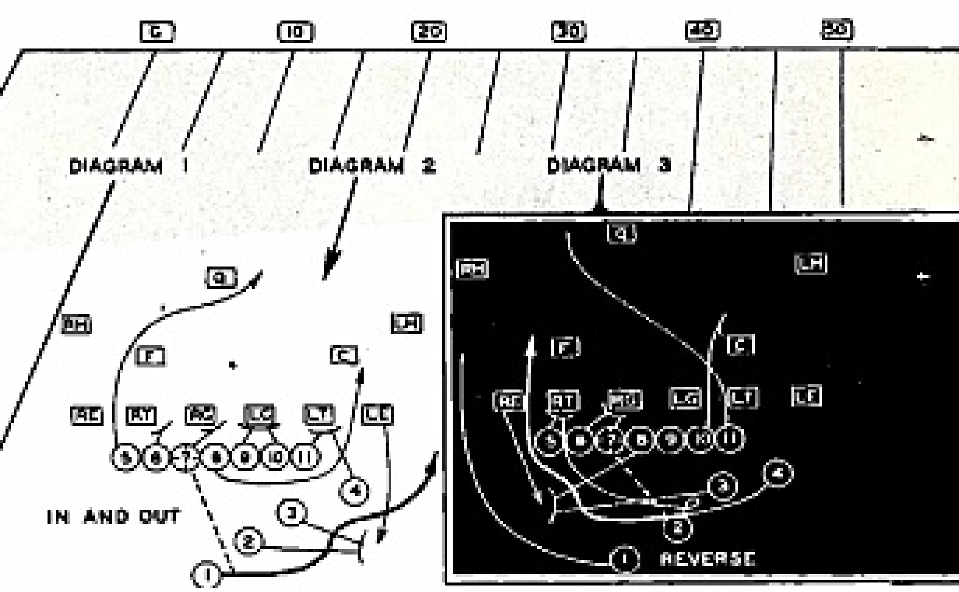
But let us trail him around in invisible guise. Are you ready for the kickoff?

There goes the ball, curving gracefully into the arms of the opponent fullback as he stands a yard behind his goal line. These opponents are not going to be a cinch. They too have the champion spirit as well as sound football technique and the game is apt to

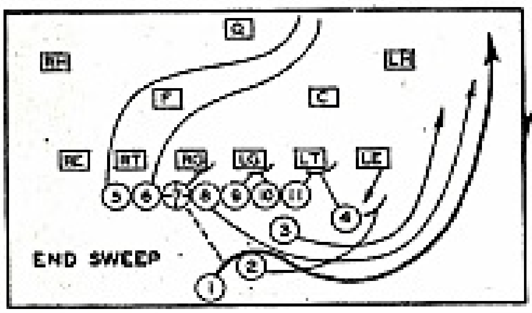
40
30
20
10
GOAL

Left—Past the 50-yard line and into enemy territory, the quarter calls for a pass, and Cal Clemens, U. of S. C. takes it to defeat Oregon U. Above—Goal in sight. Signals! A line smash, and Murray of Penn scores against Cornell.

Great Quarterbacks Make Good Teams Great



What to watch for in your next game. Coach Bierman diagrammed six of his favorite plays, each one designed to be used in a certain part of the playing field. Note how plays become increasingly spectacular as the ball is marched down the field, and the strength behind the power drive near goal.



How an All-American quarterback looks to his opponent center. Cotton Warburton, U. of S. C., caught as he received a pass from center.

Football—Sport of Ages

"This stone commemorates the exploits of William Webb Ellis, who, with a fine disregard for football rules, first took the ball in his hands and ran with it, thus originating the distinctive features of the Rugby game. A. D. 1823." So reads the inscription on an ancient stone in the wall around the Rugby School for boys in England. But football goes back farther than that.

The Greeks had a word for it, and later, Roman legions carried a more vigorous form of the game throughout Europe. By 1200 A. D. the game consisted of sides of unlimited numbers, each intent on kicking a round stone or inflated bladder across the opponent's line. Legs, arms, and even skulls were broken in the fracas. By Shakespeare's time, every school in England had a football team.

Phillip Stubbes, writing in 1583, says, "As concerning foote-balle, I protest unto you it may rather be called a bloody or murthering practice than a fellowy sport or pastime. For dooth not everyone lie in wait for his adversary, seeking to overthrow him and pickle him on the nose . . ."

Way before 1800 the Indians were showing American youths a crude kicking form of football with few rules but plenty of broken shins. It was not until 1845, however, that Harvard had its first crack teams, with other colleges starting shortly after. The first intercollegiate game was held at New Brunswick, N. J., in 1869, when Rutgers college put 26 men on the field to swamp Princeton's 21 man team. Later rules reduced the teams to 11 men each.

turn on the skill of the respective field generals to take advantage of the breaks.

Our quarterback, in conference with his coach, has scouted that fact, however, and has arrived at certain definite conclusions which form his plan of battle.

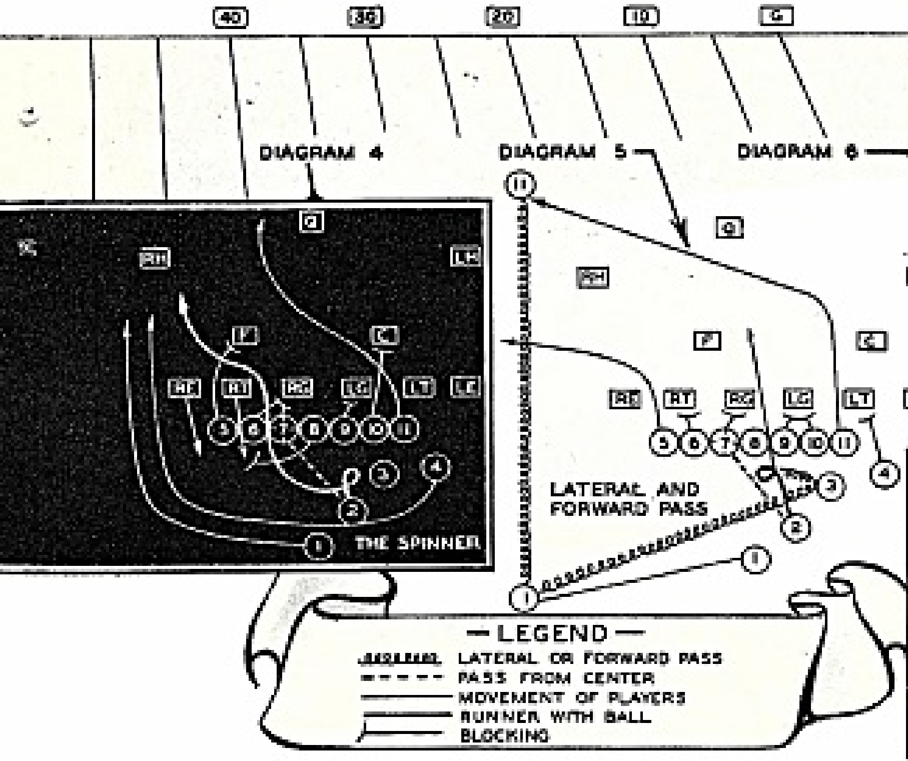
His line is powerful, fast and strong—big and speedy enough, in fact, to spare a man from the center to play back on defense and aid the secondary. This arrangement should meet the opponent's running game with more than fair success.

But there is a smart forward pass attack to cope with, too, and so the coach and the quarterback have decided to make a waiting game of it—let the other fellow do the work while we hold on and see what he has. No use getting all fagged out and excited. The opponents are known for their liking to score early if they can. They may press too hard and make a mistake or two.

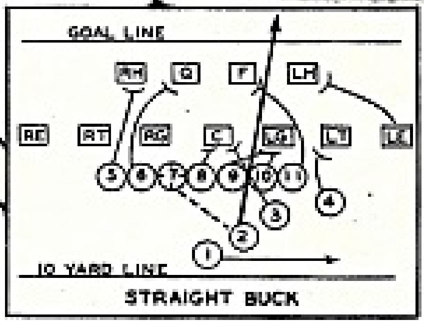
The opponent fullback carries the ball back 22 yards before being downed. He carries it again on the first down and gains a yard. An end sweep comes next, but our big end knows that one and dumps it for a two yard loss.

The punt that follows, sails down the field 45 yards and strikes the ground near the sidelines. Our quarterback gathers it in on the bounce but we can see he hasn't his hands on

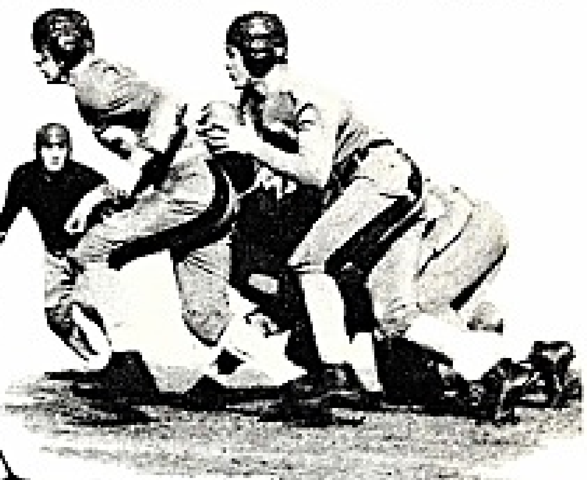
First Half—BRAINS; Second Half—POWER!



— LEGEND —
LATERAL OR FORWARD PASS
PASS FROM CENTER
MOVEMENT OF PLAYERS
RUNNER WITH BALL
BLOCKING



STRAIGHT BUCK



Perfect interference is being given Capt. Felts of Tulane as the Green Wave tackled U. of S. C. in the Rose Bowl game. With all eyes on the ball carrier, only a few football wise veterans know when to cheer good interference. But the score will show it.

it before a big tackle streaks through the air and crashes him to the ground.

Fumble—and when the pileup untangles, an opponent guard is flattened safely over the ball. Too bad, but our quarterback isn't flustered. He has gone into the game calmly and this is just a bad break that must be met and overcome.

The opponents line up quickly now. The ball is snapped, a scurry of jersey clad forms ensues, and suddenly, a big back is emerging to the right on a reverse play. Other forms dart forth to block for him and a three yard gain results. A forward pass comes now, but our center smothers that and then a long pass is tried that the right half bats down.

The punt that follows rolls over our goal line and is brought out 20 yards.

All right, Mr. Quarterback. you have the ball now, let's see what you've got.

Our quarterback tries an end sweep (diagram 1), one of his brilliant halfbacks taking the number 1 position while he becomes number 3 to help block up the field. It isn't our quarterback's policy to tire himself unduly or take chances of getting banged up carrying the ball too often. The sweep gains only a yard and then comes a punt.

So it went during the first period and most of the second, our men keeping their heads and playing strong defensive football to hold the opponents when they had the ball. When he did get the ball, our quarterback used only safe plays—the plunge and the sweep described above, varied with an in and out play (diagram 2) and a reverse (diagram 3).

Only one first down resulted from such tactics for our side, on other occasions our right half punting the ball down the field.

With five minutes of the second quarter remaining, however, the opponent fullback found a hole through our left side and came through on a spinner for eight yards. Two more yards for a first down resulted from a slide off tackle.

A forward pass tried on the next play was grounded by our fullback and then the big opponent fullback found the hole in our left side again with his spinner. He came 11 yards and our entire secondary, including our quarterback, moved in to stop him.

Suddenly, he turned and flipped the ball to the left. A halfback had sneaked through another hole behind him and now took the ball on the dead run for a clear romp 45 yards over the goal line. The goal kick was good as a matter of course—the opponents having a guard who never missed.

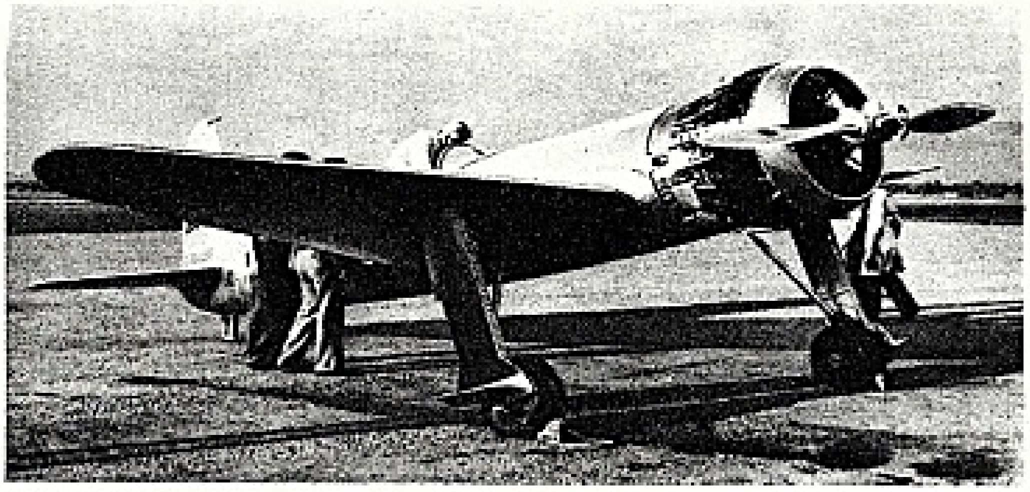
We kick again to the opponents, now chaffing and eager for more scoring. But the calmness of our quarterback is reflected in the other team members and they settle down to hold again as if no score had been made.

Twice more before the period ends, our

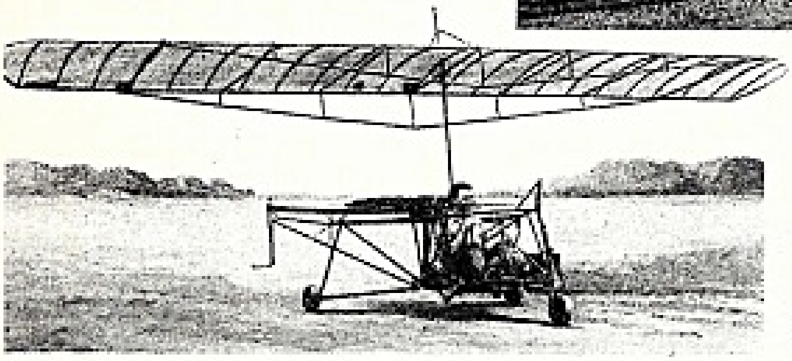
[*Continued on page* 132]

Seek BETTER Airplanes in New Designs

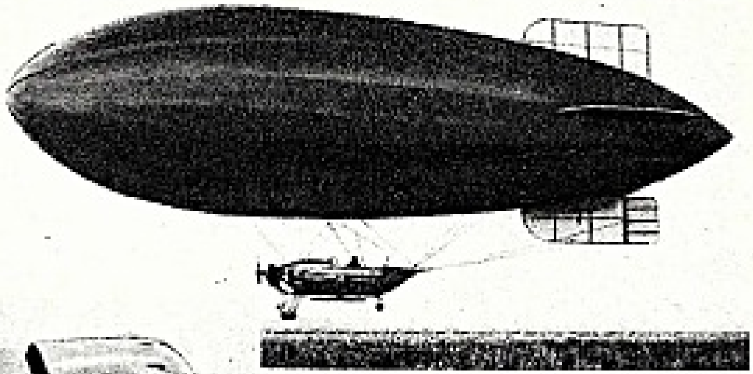
IN THE thirty-two years since the Wright brothers first flew a motored airplane, aviation has never slackened in its phenomenal strides towards perfection. The terrific pace has cost the lives of many brave pilots, but today, as yesterday, a successful plane is but the stepping stone to something even more successful. Here are air craft in the news of today.



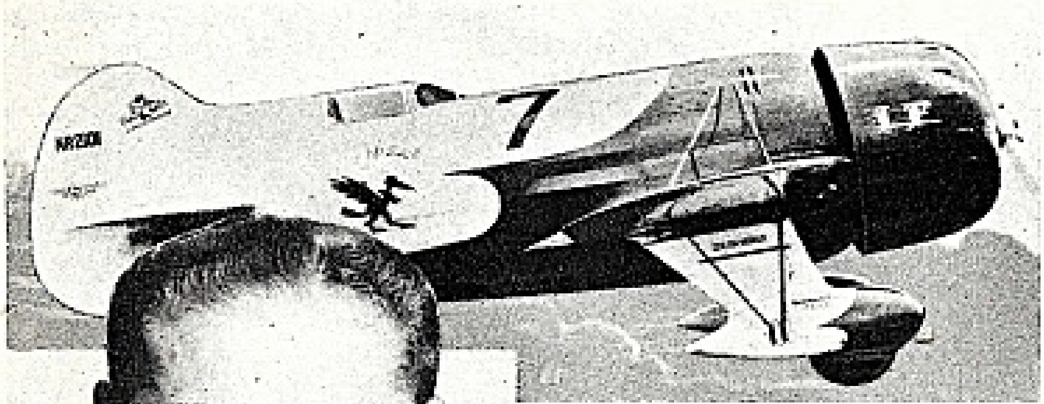
More than $125,000 has been expended in the development of this mystery plane, built by Howard Hughes, Hollywood film producer for army use. It has a cruising speed of 300 m.p.h. and can carry concealed machine guns and bombs.



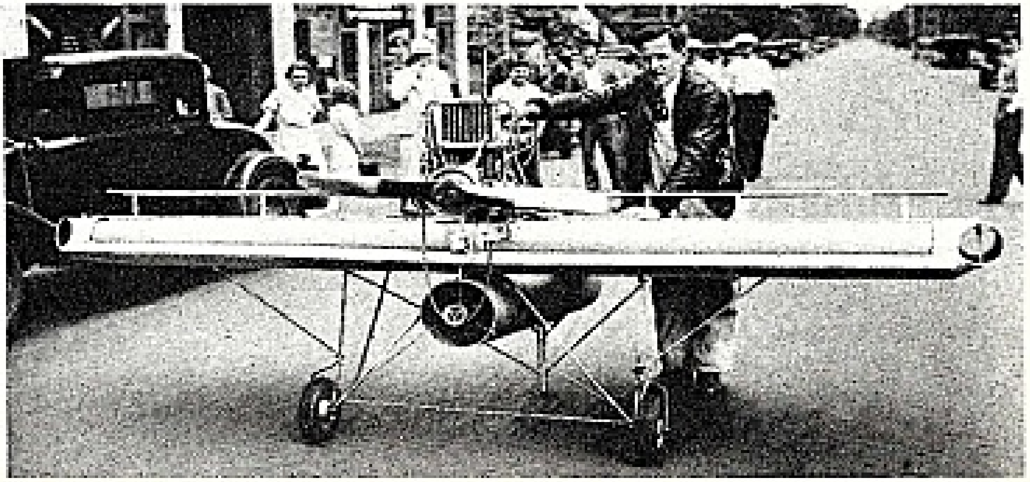
In sharp contrast to *Hughes'* sleek aerial demon is George S. Spratt's unique craft which weighs but 200 pounds. Spratt's father was associated with the Wright brothers in their early experiments, and suggested the design. It is operated by direct control, and carries gas enough for a ½-hour flight.



M. DeVille, a French airship constructor, has equipped a semi-rigid ship with two propellers, one of the conventional traction propellers, and the other a propeller to raise and lower the ship vertically. Huge ground crews will not be needed with his ship. Below—Another midget plane is this of A. S. Kramer, Chicago. It weighs but 117 pounds, yet is capable of supporting a 150-pound pilot and 30 pounds of fuel. It has a 6 h.p. motor, and a wing spread of 11 feet. It needs no tail rudder.



Death on swift wings overtook Cecil Allen, famous Trans-Pacific flier, as he launched his 1,000 horse power bullet into the air for the start of the Bendix trophy race. His plane was claimed to have the perfect streamline design.



Rubber Band Planes Soar Into Fame As World Records Fall

ALL previous records set by rubber band motored model airplanes fell during the current season as an ever increasing number of young fliers launched their frail crafts into the air for new marks. Record attendance was chalked up at all model air meets.

In St. Louis, Mo., 18-year-old Russell Yungbluth of that city sent a model of his own design into the air. For 12 minutes and 40 seconds it flew within sight of the judges, to break Yungbluth's 1934 world's record, before speeding out of sight. The event was won, however, by Kenneth Ernst, 19, of Indianapolis, with a record flight of 20 minutes, five seconds.

Later, at the Junior Aviator Air races in Cleveland, Leonard Becker, 18, of Lakewood, Ohio, set a new world speed record of 60 miles per hour with his model. During part of the flight the model approached 70 miles per hour.

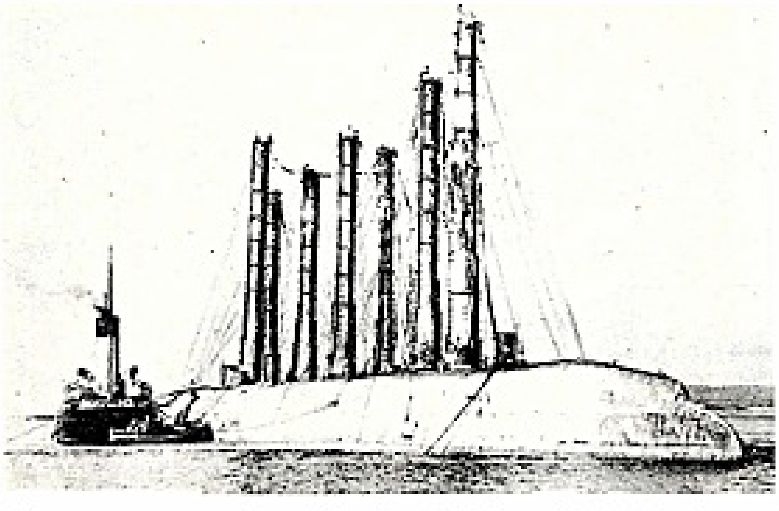
Because of the great interest shown in Russell Yungbluth's record-breaking model, detailed plans and full instructions for building it will be included in an early issue of this magazine.

Here are two rubber band powered model airplanes that broke world's records. Russell Yungbluth, top, broke his own world's record with a flight of 12 minutes, 40 seconds, and Leonard Becker, below, set the world's speed mark of 60 m.p.h. with his craft. Great crowds attended the meets.

Air Locks Raise Sunken Battleship

BACK to the surface once more floated the *Konig Albert,* after Scottish salvagers succeeded in fastening air locks on the hulk of the former German battleship, which was scuttled in Scapa Flow in 1919.

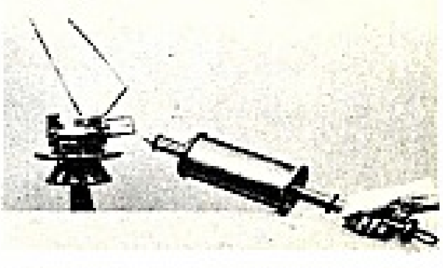
The *Konig Albert* was one of the German battleships sunk by her own crew, when, long after the Armistice, it appeared that the British would take over the fleet. The use of 100-foot air locks is new in salvage work.



These are not smokestacks, but 100-foot air locks fastened to keel of *Konig Albert,* ex-German battleship. The ship was raised from the bottom of Scapa Flow by Scottish salvagers.

Volt Detector Reveals Live Wires

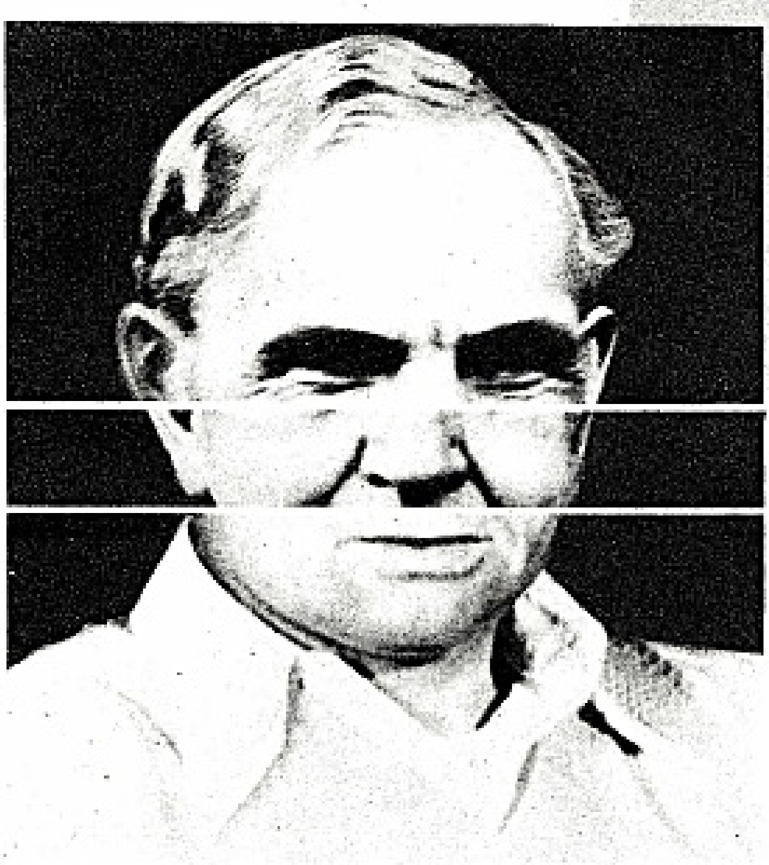
A 60,000-volt pressure detector requiring no ground connection has been instrumental in saving many lives by testing live wires previously thought to be dead. Before any work is done on "disconnected" electrical apparatus, normally highly charged, the detector is necessary to give positive proof that the circuit is really dead. If the circuit is alive, there is an audible snap and a bright flash as the detector is drawn away.

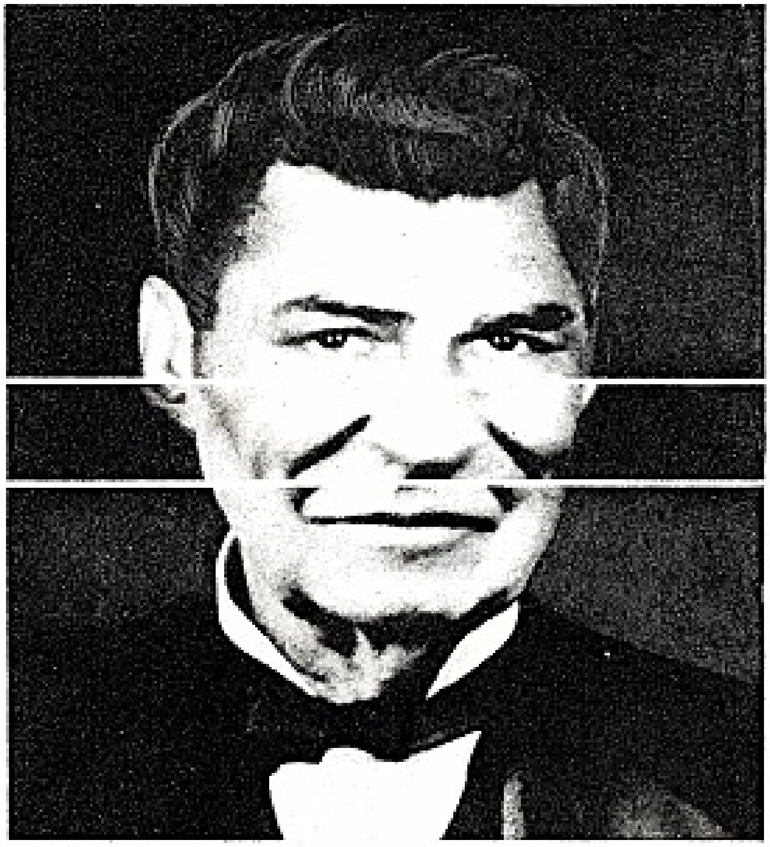


This volt detector acts as an air condenser in discovering live wires. Needs no ground, and is infallible.

Unscramble Photos to Win

123 CASH PRIZES for Best Solutions





HERE'S your chance to win $750.00 or any one of the other 122 prizes in this big $1,750.00 cash contest. The contest is simple enough for anyone.

Hidden away in the three scrambled pictures on these pages are the photographs of three prominent men. You have seen their faces displayed often in newspapers and magazines. They are leaders in the field of science, industry, aviation, sports, and exploration.

All you have to do is cut the pictures on the white lines and reassemble them in their proper order. Identify them and follow the rules on the next page.

In all, nine scrambled photographs will be published. Do not send in your entries until all nine have been published. Do not ask the Contest Editor for further information. All the information you need to win a prize in this contest is published on these pages.

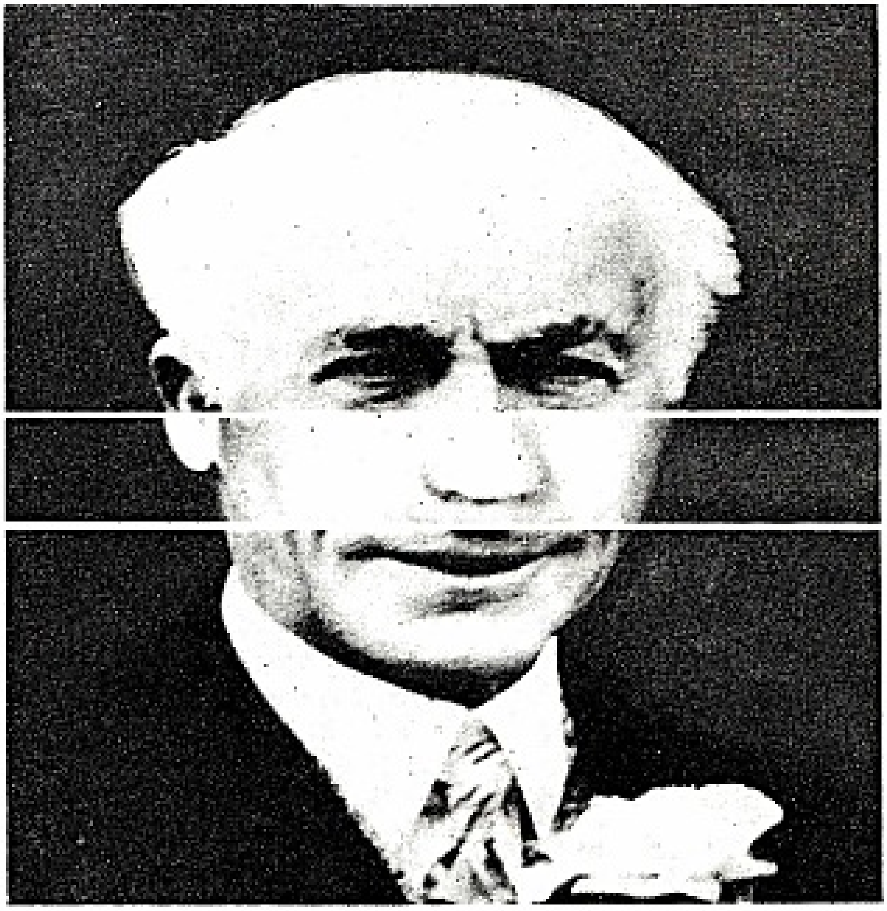
The three scrambled photographs published this month can be assembled into three likenesses of prominent men. To assist you, here are some tips to their identification: One of them is a leader in the automobile industry; another was one of the most popular sports champions in this country; and the third was a world-renowned inventor.

To be eligible each entry must include answers to questions on the next page and a slogan of ten words or less. The slogan should describe this magazine. Here is an example "Everybody's Magazine of Modern Science and Inventions." This slogan, of course, cannot be used by contestants.

$1750.00 CASH Contest

THE PRIZES

First prize	$750.00 IN CASH
Second prize	300.00 IN CASH
Third prize	100.00 IN CASH
10 Fourth prizes	20.00 EACH
10 Fifth prizes	10.00 EACH
50 Sixth prizes	5.00 EACH
50 Seventh prizes	1.00 EACH
TOTAL—123 PRIZES	$1,750.00 IN CASH



ANSWER THESE QUESTIONS

1. What is your age and occupation?
2. Do you live in an apartment, house, or on a farm?
3. What is the approximate value of your shop tools?
4. What tool or power equipment do you plan to purchase next for your home shop?
5. Approximately how much do you spend each year for lumber, paint, and hardware? List each separately.
6. Do you read any other magazine containing home workshop projects?
7. Are you interested in projects devoted to (a) metal working, (b) wood working, (c) electricity and radio, (d) model making, (e) chemistry, or (f) photography?

THE RULES

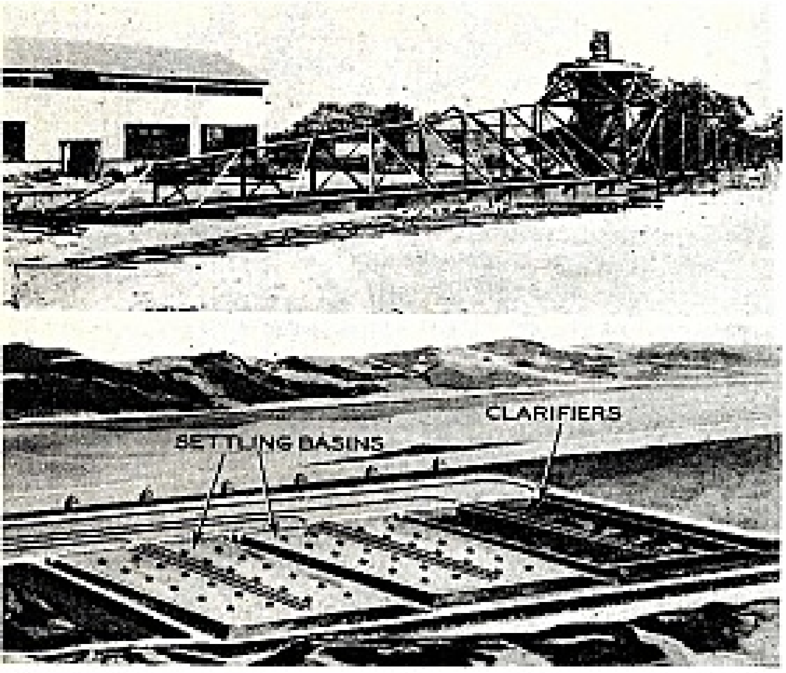
1. Cut out the three sections in each scrambled photo. Reassemble the parts in their proper order to form photographs of prominent men or women.
2. Paste each assembled photograph on a sheet of paper. Identify these men or women by name and tell, in 25 words or less, the part each played in his or her particular field of activity.
3. DO NOT MAIL YOUR ENTRY UNTIL ALL NINE SCRAMBLED PHOTOGRAPHS HAVE BEEN PUBLISHED. Three more photos will be published in the December issue and the final three scrambled pictures will appear in the January issue.
4. Copy and answer the questions listed above and submit them with your entry. Your replies to these questions will not be considered by the judges in awarding prizes, but to be eligible each entrant MUST answer the questions.
5. In ten words or less write a slogan that in your opinion best describes Modern Mechanix and Inventions Magazine. Slogans are to become the sole property of Modern Mechanix Publishing Co.
6. This contest is open to everyone except employes of Modern Mechanix Publishing Co., and members of their families.
7. You don't have to buy a copy of this magazine or be a subscriber to enter this contest. Recognizable facsimiles of the photographs will be considered by the judges.
8. Contestants need not submit elaborate entries. Neatness, brevity, and accuracy will be the deciding factors. No entries will be returned.
9. The editors of Modern Mechanix and Inventions Magazine will be the judges. Their decisions are final. In case of ties duplicate prizes will be awarded.
10. Mail your entry to Contest Editor, Modern Mechanix and Inventions Magazine, Minneapolis, Minn. Write your full name and address clearly. Entries must be postmarked on or before Jan. 3, 1936. Winners will be announced as soon as possible after the close of the contest.

Giant Laundry Will Wash River for Irrigation Canal

MORE than 70,000 tons of dirt a day is to be the capacity of the world's largest washing machine about to be installed at the Imperial dam of the Colorado river near Yuma, Ariz. The laundry will not, however, deal with fabrics, but with the muddy Colorado river itself.

Before diverting part of the river into the 210-mile All-American irrigation canal, it will be necessary to remove the greater part of the silt which would otherwise clog the canal.

Six settling basins will admit the river water, and as the silt slowly sinks, 72 clarifiers, each 125 feet long, and with 12 in each basin, will scrape it into wells.

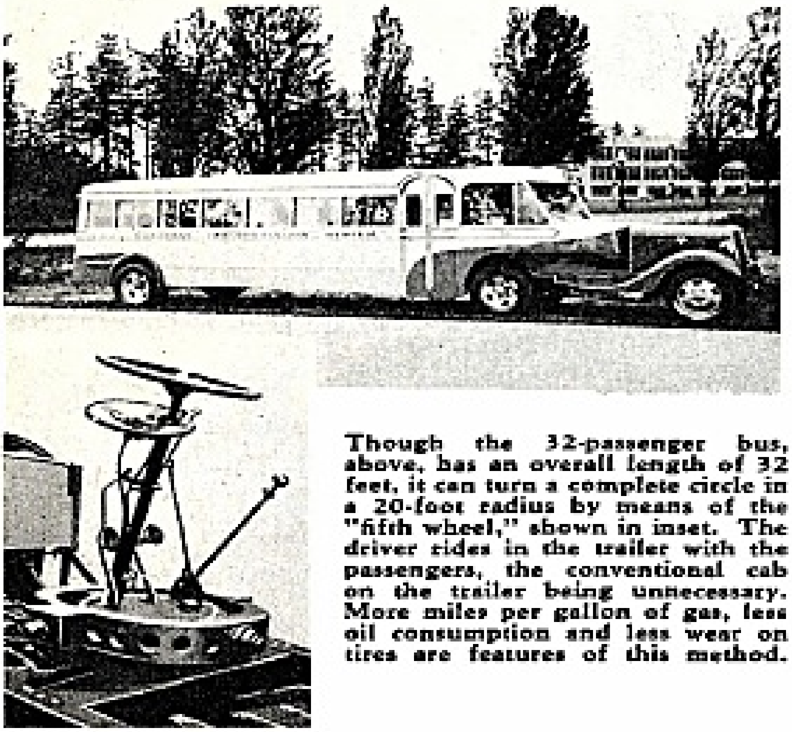


This 125-foot clarifier, resembling a miniature drawbridge, is one of the 72 which will be used to wash the Colorado river. Plans for the giant laundry are shown in lower photo.

Driver Controls Bus from Trailer

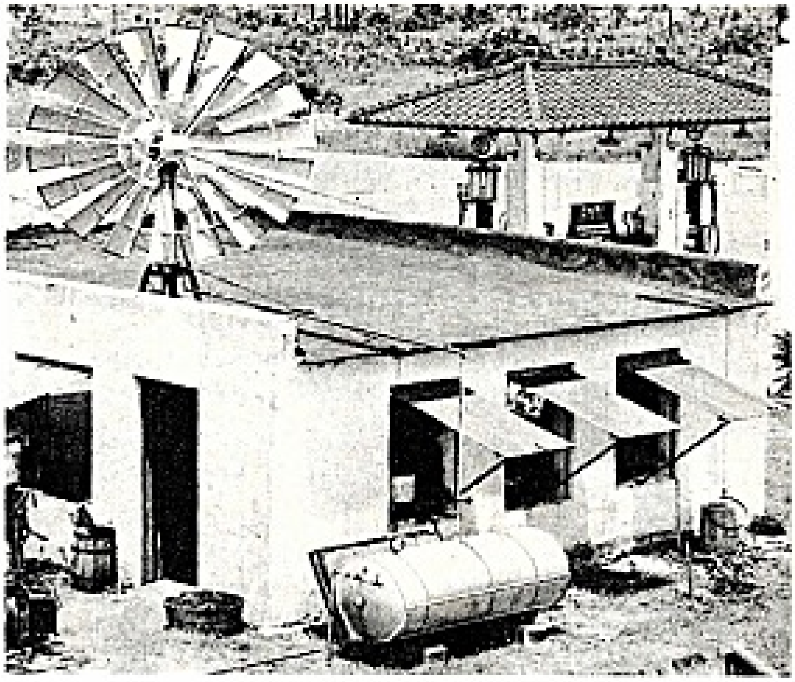
THE driver's seat and all controls are located in the front end of the trailer of a 30-passenger semi-trailer bus now in operation in Seattle, Wash. The tractor has no cab.

A fifth wheel which hooks up the tractor and trailer and also acts as a full universal joint to provide for steering and shifting of gears. A Ford V-8 truck supplies the power.



Though the 32-passenger bus, above, has an overall length of 32 feet, it can turn a complete circle in a 20-foot radius by means of the "fifth wheel," shown in inset. The driver rides in the trailer with the passengers, the conventional cab on the trailer being unnecessary. More miles per gallon of gas, less oil consumption and less wear on tires are features of this method.

Windmill Serves As Air Compressor



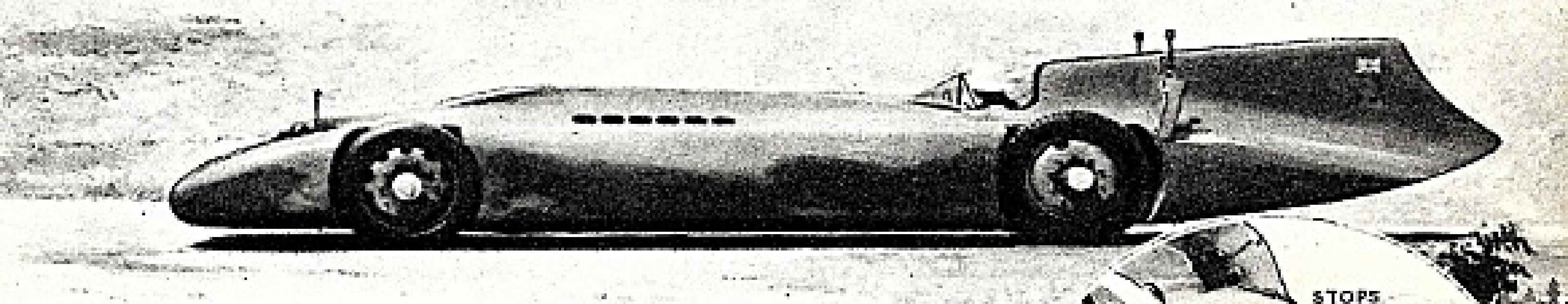
This is a windmill in the fullest sense of the word in that it uses wind for power to compress wind for concentrated power. It is the invention of Palmer Crary, Miami, Florida.

VAGRANT breezes which pass by his filling station are used by Palmer Crary, Coconut Grove Station, Miami, Fla., to inflate the tires of his patrons, and also power a small generator unit.

Located beyond the power lines, and not wishing to install an expensive power plant, Crary invented a windmill air compressor which not only kept his air tank at capacity pressure, but also augmented his light plant in generating electricity.

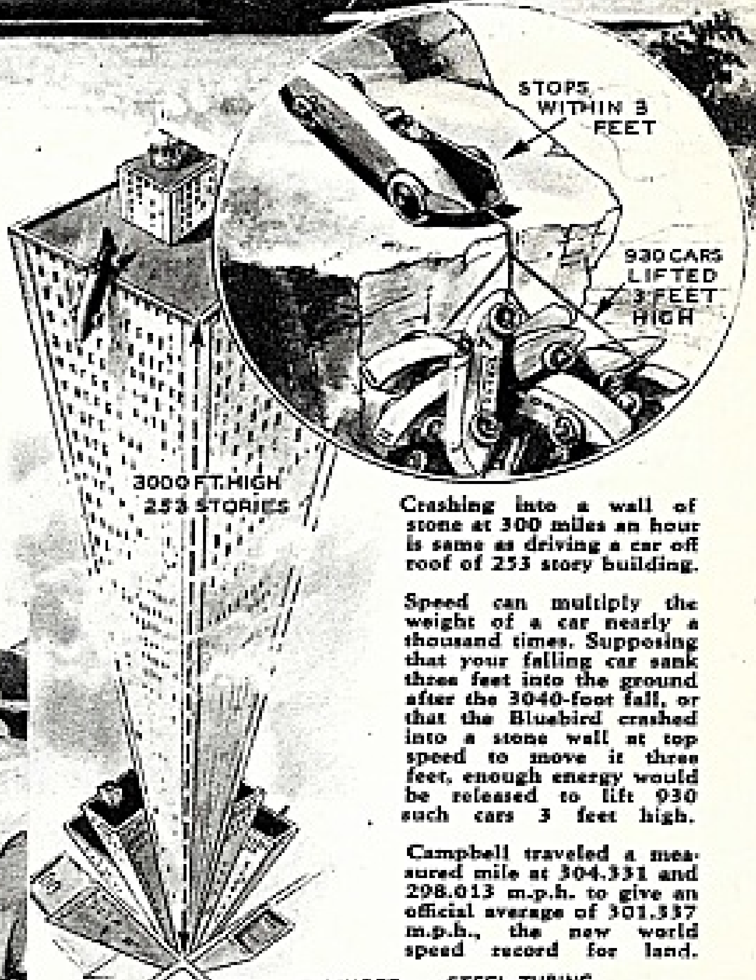
A large air tank is used which prevents any possibility of there being a lack of pressure even when the air is calm for days.

AUTO CRASHING After 3000-Foot FALL Equals CAMPBELL'S 301 M. P. H. Record



On the world's greatest speed course, the Bonneville Salt Flats in Utah, Sir Malcolm Campbell piloted his mighty *Bluebird* to a new world record of 301.337 m.p.h. Sept. 3.

"HUMAN Bullet" Campbell, fifty years old, has finally reached his goal—to travel faster than 300 miles an hour. In two thundering dashes over the thirteen-mile long sheet of solid white Utah salt of the Bonneville Salt Flats, Campbell traveled as fast in his six-ton, 1,450 horsepower *Bluebird* as if he had driven the car off the top of a 3,000-foot high building. This speed is but a fraction of a mile under the United States airplane speed record.

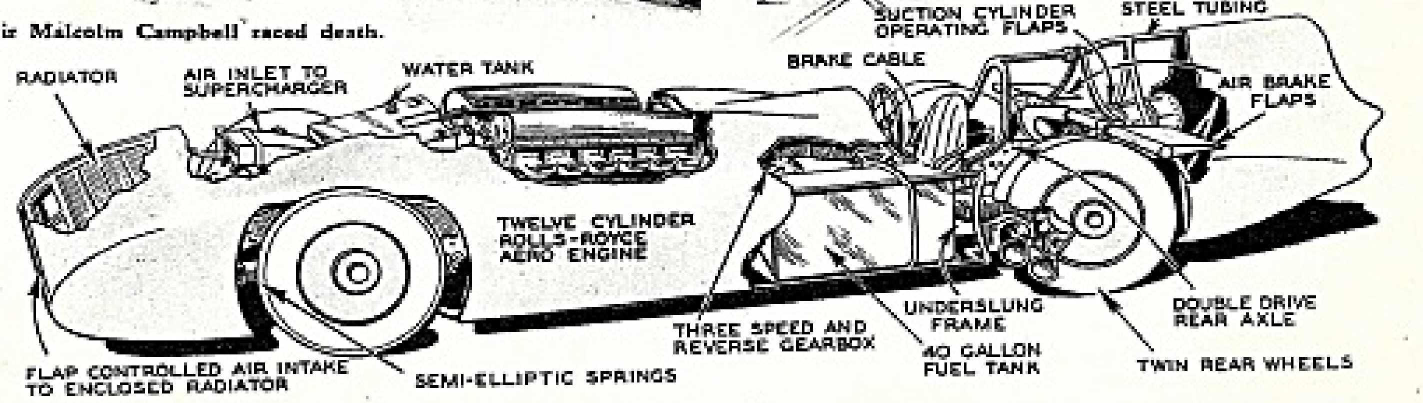

STOPS WITHIN 3 FEET
930 CARS LIFTED 3 FEET HIGH
3000 FT. HIGH 253 STORIES

Crashing into a wall of stone at 300 miles an hour is same as driving a car off roof of 253 story building.

Speed can multiply the weight of a car nearly a thousand times. Supposing that your falling car sank three feet into the ground after the 3040-foot fall, or that the Bluebird crashed into a stone wall at top speed to move it three feet, enough energy would be released to lift 930 such cars 3 feet high.

Campbell traveled a measured mile at 304.331 and 298.013 m.p.h. to give an official average of 301.337 m.p.h., the new world speed record for land.

Sir Malcolm Campbell raced death.


SUCTION CYLINDER OPERATING FLAPS
STEEL TUBING
RADIATOR
AIR INLET TO SUPERCHARGER
WATER TANK
BRAKE CABLE
AIR BRAKE FLAPS
TWELVE CYLINDER ROLLS-ROYCE AERO ENGINE
UNDERSLUNG FRAME
DOUBLE DRIVE REAR AXLE
THREE SPEED AND REVERSE GEARBOX
40 GALLON FUEL TANK
TWIN REAR WHEELS
FLAP CONTROLLED AIR INTAKE TO ENCLOSED RADIATOR
SEMI-ELLIPTIC SPRINGS

Inner secrets of fastest automobile in the world are revealed in this cutaway sketch. Just as Campbell began to slow down after first speed run left front tire blew out, catching fire and wrecking fender. Car swerved slightly off course, but was quickly brought under control again. Above photo of tire, taken just after fire was extinguished, shows shreds of tire on fenders.

Jimmie Doolittle ANSWERS YOUR QUESTIONS *about*

EDITOR'S NOTE—*Though one of this country's most famous flyers, Jimmy Doolittle is not just another stunt pilot. If you would become an aviator, heed these words of a pilot who has studied as well as stunted—who has followed his own advice.*

Born in Alaska, Jimmy has had a varied life as prospector, boxing champion, war ace, army aviation expert, test pilot, and air adventurer. Audaciously fearless, he has "twisted" the wings off many an untried plane by his breath-taking test dives, and was the first to fly across the treacherous Andes.

By air mass analysis, airline meteorologists, in constant touch with planes by radio, predict weather 48 hours ahead.

Q. WHAT do you think, Mr. Doolittle, about aviation as a career for a young fellow to follow?

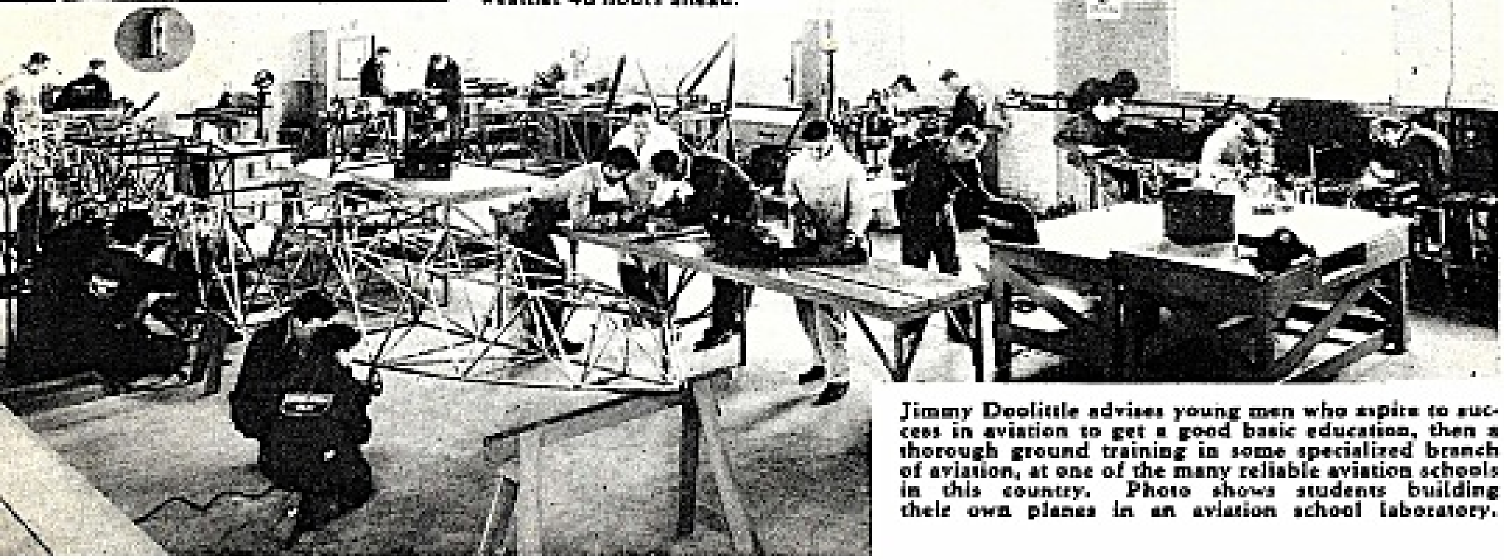
A. Looks good to me. It's a *young* man's game—good thing to get into and grow up with. There was a time when railroading was the thing. When autos came out, that was the place for the young fellow. Now it's aviation—and will be, as far as I can see, for a good long time to come.

Q. What would be your advice to a young fellow thinking of getting into aviation?

A. First, he should get a *good basic education*. Piloting should be secondary, an avocation rather than a vocation. To be successful he must be thoroughly grounded in some special branch of aviation.

Q. Is that because aviation is more complex nowadays?

A. Not altogether. It used to be when a fellow thought of "going into aviation" he meant that he was going to take some flying lessons and become a pilot. Much of the glamor has gone out of flying now, and the fellow who goes into it with that in his mind is headed for disappointment. To be only a pilot is rapidly becoming comparable to being



Jimmy Doolittle advises young men who aspire to success in aviation to get a good basic education, then a thorough ground training in some specialized branch of aviation, at one of the many reliable aviation schools in this country. Photo shows students building their own planes in an aviation school laboratory.

AVIATION

Questions by
RALPH BAKER
Answers by
JIMMY DOOLITTLE

Did you ever wonder if airplanes will ever become as common and safe as autos, if Diesels would be used in planes, or if the next war will be in the air? Here are all the answers—by aviation's expert.

A recent photo of ever-smiling Jimmy Doolittle, taken in flying togs with parachute strapped on.

Will light planes like this 1935 Aeronca become as common as automobiles? Read Mr. Doolittle's interesting answer.

For every mile plane speeds are increased, a new safety feature is developed. Here are the "stop and go" lights—red and green—used by airport officials to prevent accidents when many planes are landing or taking off at same time.

the engineer of a train, or the driver of a car or bus.

Q. Then just what should he do?

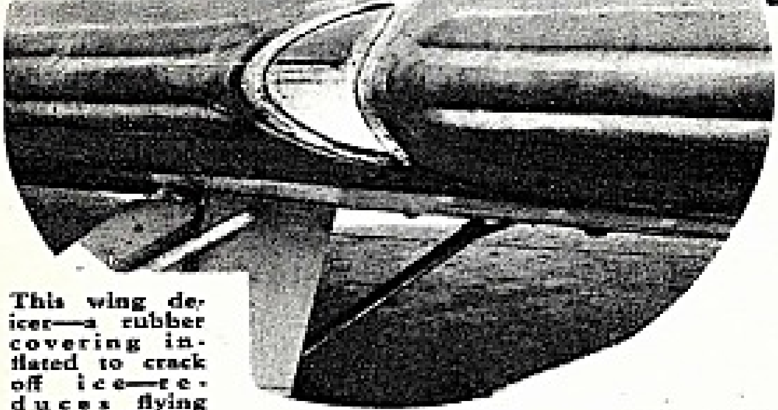
A. If he wants to get ahead, he should study some *specialized* branch—engineering, maintainance, designing, operations—and piloting. Whatever he takes up, he can advance if he has a good thorough background.

Q. How do you think the airplane stands in relation to other methods of transportation?

A. Well, the airplane is just about the safest, most comfortable and fastest means of

AIR TRANSPORT PLANES CUT TRAVEL HOURS

Safety, speed, and service are three reasons why transport planes are today carrying full quotas of passengers and freight.



This wing de-icer—a rubber covering inflated to crack off ice—reduces flying hazards in sleet storms.

Jimmy Doolittle peers out of the cockpit of the speedy plane he uses on cross-country jaunts for a large oil company.

getting from one place to another. Aviation has constantly been increasing its safety and speed, while the trains, until just last year, had made practically no change for some 28 years. Cars, meanwhile, have been increasing their speed and, due to more congested traffic conditions, becoming more dangerous. Methods of transportation other than airplanes have practically reached their peak, while airplanes are just starting.

Q. Will the airplane, then, become as common as the automobile is today?

A. No. Absolutely no. That's utter folly—a fanatic's dream. There's a need for autos that probably never will be duplicated. The average American will let go of everything else before he will let his car go. Look at the last depression—at least, I hope it's the last—men hanging onto their cars when they'd lost almost everything else. They let their yachts go first and then their homes, but their cars, never!

Traffic congestion, though, is becoming quite a problem. As traffic congestion becomes worse and worse, more of us will take to the open lanes of the sky. The airplane will continue as a luxury, however, for private use. A man will need his car to get to work, but except in a comparatively few special cases he will want an airplane mainly for Sunday

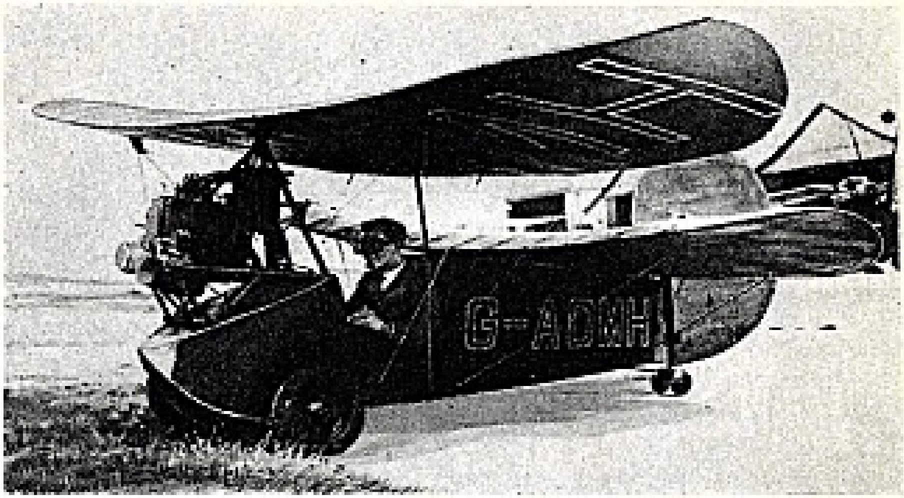
[*Continued on page* 136]

British Aviator Builds "Flying Louse" Plane For $450

BUILT by unskilled labor at a cost of less than $450, the first English built "Puce Du Ciel" (Flying Flea), a midget airplane, was successfully tested recently at the Heston Aerodrom, England.

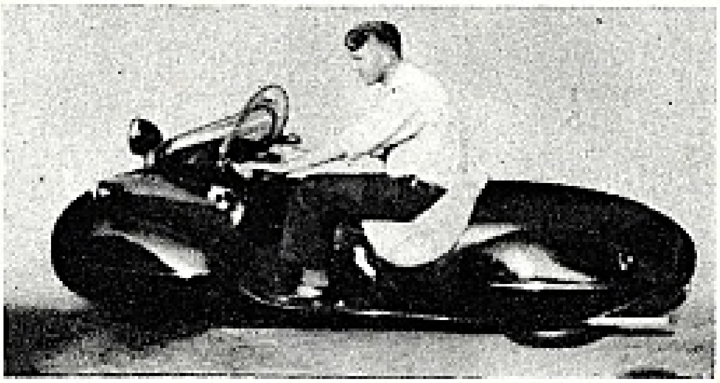
The tiny craft, of a design so popular in France, has a wing spread of but ten feet, with two wings mounted in tandem fashion on the stubby fuselage. The motor is placed directly in front of the open cockpit, but is so small as to afford ample vision.

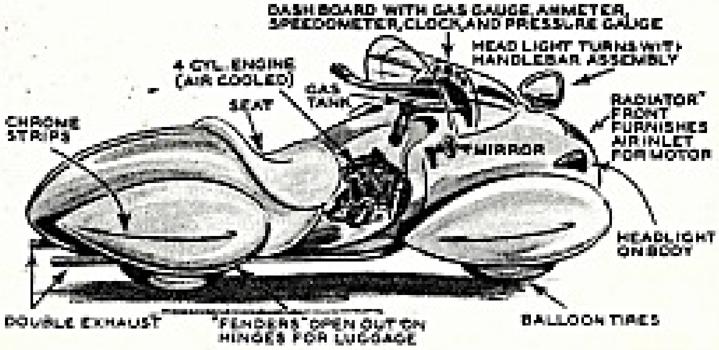
Because of the safe maneuverability of the plane, it is attracting the attention of both amateur and professional builders in this country, and it is expected that by next spring the Flying Fleas will be common sights.



S. V. Appleby is shown at the Heston Aerodrom, England, with his Flying Louse, a midget airplane which he built at a cost of $450. The span of its wings is less than 10 feet, but tests proved it perfectly safe.

Motorcycle Gets Streamline Dress




DASH BOARD WITH GAS GAUGE, AMMETER, SPEEDOMETER, CLOCK, AND PRESSURE GAUGE
HEAD LIGHT TURNS WITH HANDLEBAR ASSEMBLY
4 CYL. ENGINE (AIR COOLED)
GAS TANK
SEAT
CHROME STRIPS
MIRROR
RADIATOR FRONT FURNISHES AIR INLET FOR MOTOR
HEADLIGHT ON BODY
DOUBLE EXHAUST
"FENDERS" OPEN OUT ON HINGES FOR LUGGAGE
BALLOON TIRES

Details of the streamlined motorcycle, built by Ray Courtney, Lanning, Mich. (shown on the completed model above), are shown on this phantom drawing. Note the luggage "fenders."

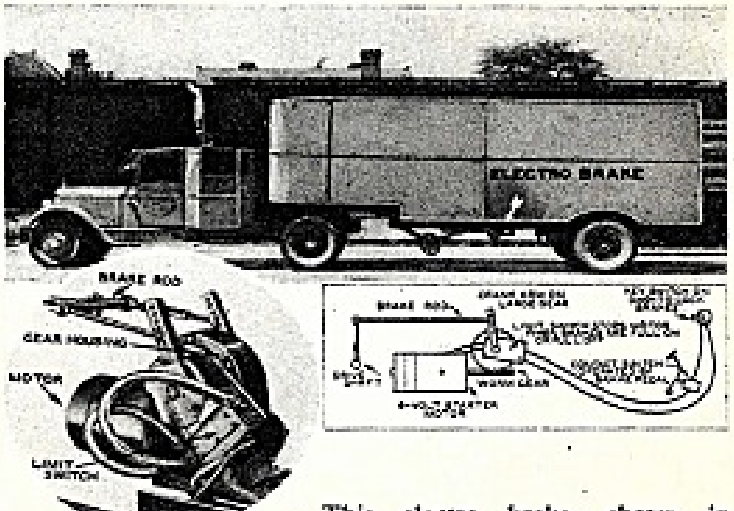
THE ultra in streamlined motorcycles has been designed by Ray Courtney, metal craftsman of Lansing, Mich., who has constructed a veritable road queen from his two-wheeled machine. The bullet shaped body is floated on both wheels with heavy coil springs controlled by oil shock absorbers.

New Brake Halts Trucks, Trailers

A NEW, positive, quick-acting electric brake for trucks and trailers has been patented by a North Carolina inventor after two years of gruelling tests resulted in no appreciable wear on the brakes.

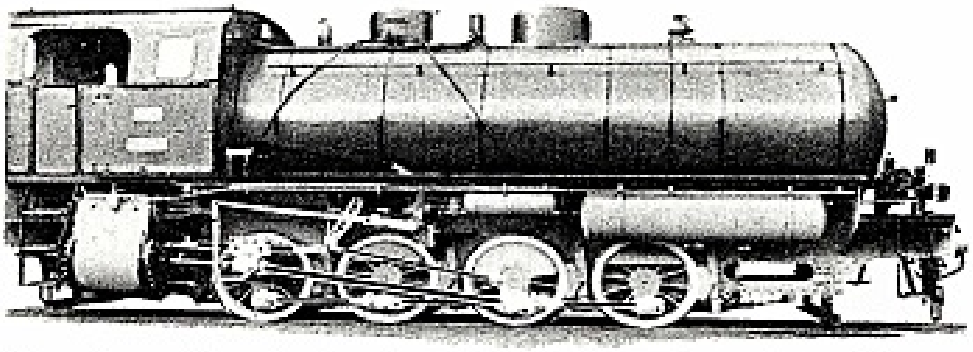
The brake consists of a motor operated crank arm for operating the conventional type of brake mechanism. The arm is mounted on the slow speed shaft of a worm gear reducer which is operated by a six-volt reversible automobile starter motor. Very little current is required for operation.

Switches connected to the foot brakes operate the motor, the operator being able to apply the brakes gently or quickly as desired. A key switch on the dash locks the brakes when the truck or trailer is parked. No current is used when the brakes are on full.


ELECTRO BRAKE
BRAKE ROD
GEAR HOUSING
MOTOR
LIMIT SWITCH
BRAKE ROD
WORM GEAR
6-VOLT STARTER MOTOR

This electro brake, shown in inset, and in place on truck, operates according to above diagram.

Locomotive Steams Up At Filling Station; Has No Fire Box



No smoke stack or fire box for this steam locomotive. It gets its steam ready made from a steam plant filling station, and runs for several hours on one filling. It was designed and built by a German company.

A STEAM locomotive without a fire box, resembling some great mechanical error, plies the rails of a German freight transfer in smokeless pursuit of its business. In place of the belching fire box there is a small intake valve, and the power is supplied by a steam plant filling station.

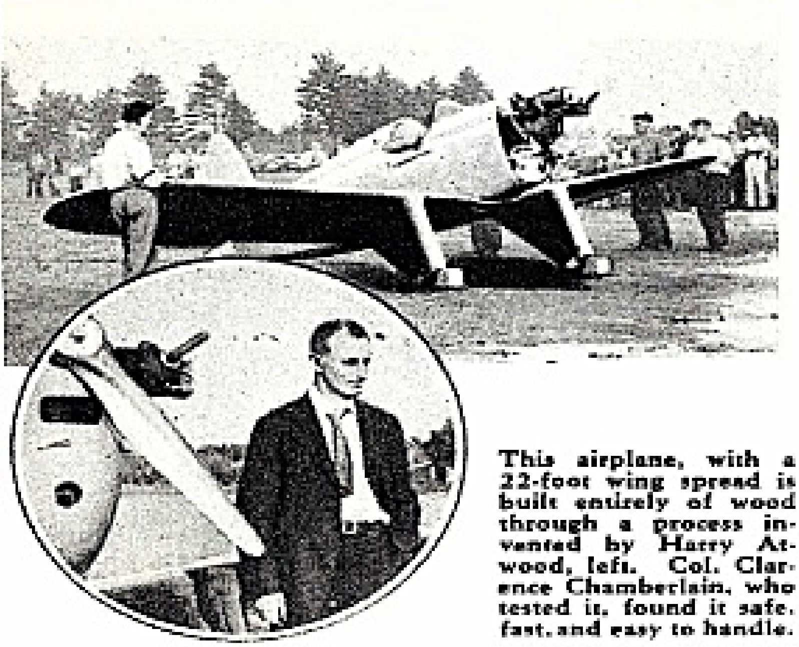
When in need of refueling, the locomotive drives up to the plant and is stocked with live, compressed steam which lasts for several hours, when absorbed by water in the boilers. The engine was designed for work around oil tanks and inside factories where fire is dangerous.

Furniture Co. Builds Wooden Planes

A 20-FOOT birch tree provides the chief item used in the construction of a "moulded airplane" built almost completely of wood, having no struts, wires and few bolts, and yet capable of a 120 m.p.h. speed while traveling 40 miles on a gallon of gas.

Forms for the 12 principle parts of the plane, such as wings, aelerons and rudder were built by the inventor, Harry N. Atwood, Milford, N. H. Birch veneer, about 10/1,000 of an inch thick is treated with a fire-proof thermo-plastic substance of his own invention and wound in layers about the forms.

The forms are then heated under pressure, fusing the plastic with the wood. The forms are then removed from within the sections, and the shell-like parts are assembled to make the strange plane. A one place job weighs about 500 pounds, and the strength of its parts exceeds the requirements. The plane, built by a furniture firm, will sell for less than $1,000.



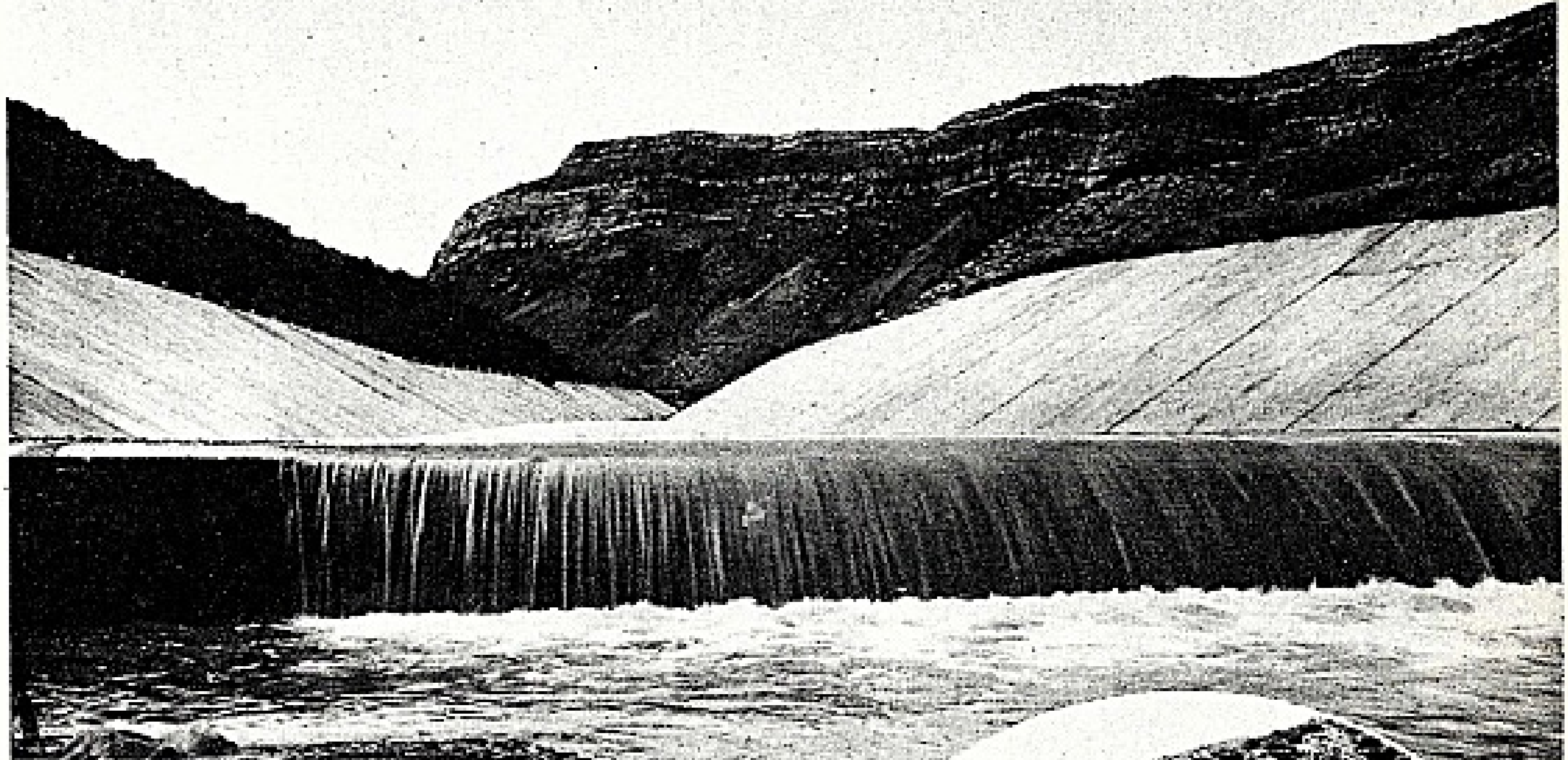
This airplane, with a 22-foot wing spread is built entirely of wood through a process invented by Harry Atwood, left. Col. Clarence Chamberlain, who tested it, found it safe, fast, and easy to handle.

Robin Feathers Nest With $5 Bill

Interior decorating in bird's nests reached a new high in Minnesota recently when Enoch Peterson found a robin had woven a $5 bill into its nest, probably to pay the rent.

EVEN the birds in Minnesota are feathering their nests with $5 bills this year. Proof that ample rains are bringing prosperity to Northwest farms was conclusively demonstrated recently at an advertising convention in Chicago when Charles F. Collisson, farm editor of the Minneapolis Tribune, exhibited a robin's rest into which was neatly woven a $5 bill. Nest was found on farm of E. Peterson, Alden, Minn.

ROAD BUILDERS Make RIVER Run UPHILL



Spring torrents rushing through this gorge are compelled to climb the 12½ degree concrete incline before dropping over the falls. This effectively checks erosion and undercutting.

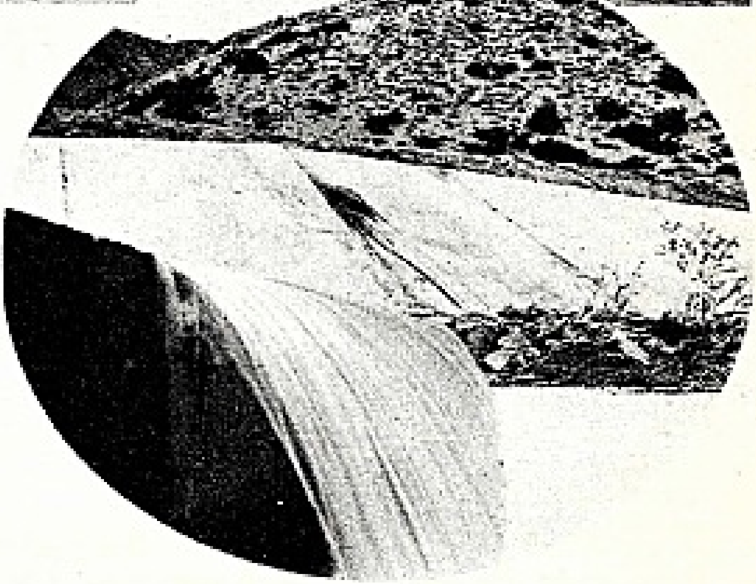
BY DEFYING the laws of gravity in diverting a river from its bed and actually running the stream uphill, California highway builders are credited with one of the most unusual engineering feats on record.

These unorthodox methods were used in the construction of the recently completed $3,000,000 "Ridge Route Alternate" between Bakersfield and Los Angeles.

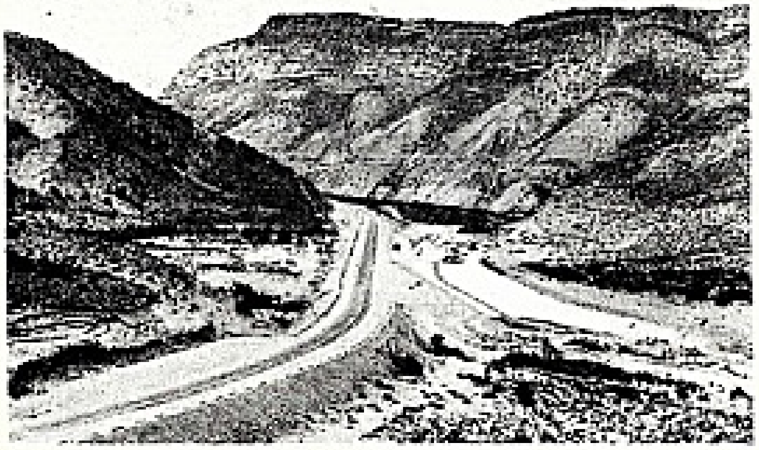
Whereas the original route ascends to 4,000-feet elevations, the new road follows valley levels, and in passing through Piru Creek gorge, crosses the stream time and time again.

To save building two bridges, the engineers cut a new channel across a U turn. The result was the shortened channel had a much sharper pitch, with a resulting increase in stream velocity.

During the spring rains, this increased velocity would be sufficient to undermine the bank on which the highway was built, and so, to check the flow, engineers built an up-hill creek bed. Now the stream rushes up to the incline, climbs with diminishing speed, and topples harmlessly over a small falls.

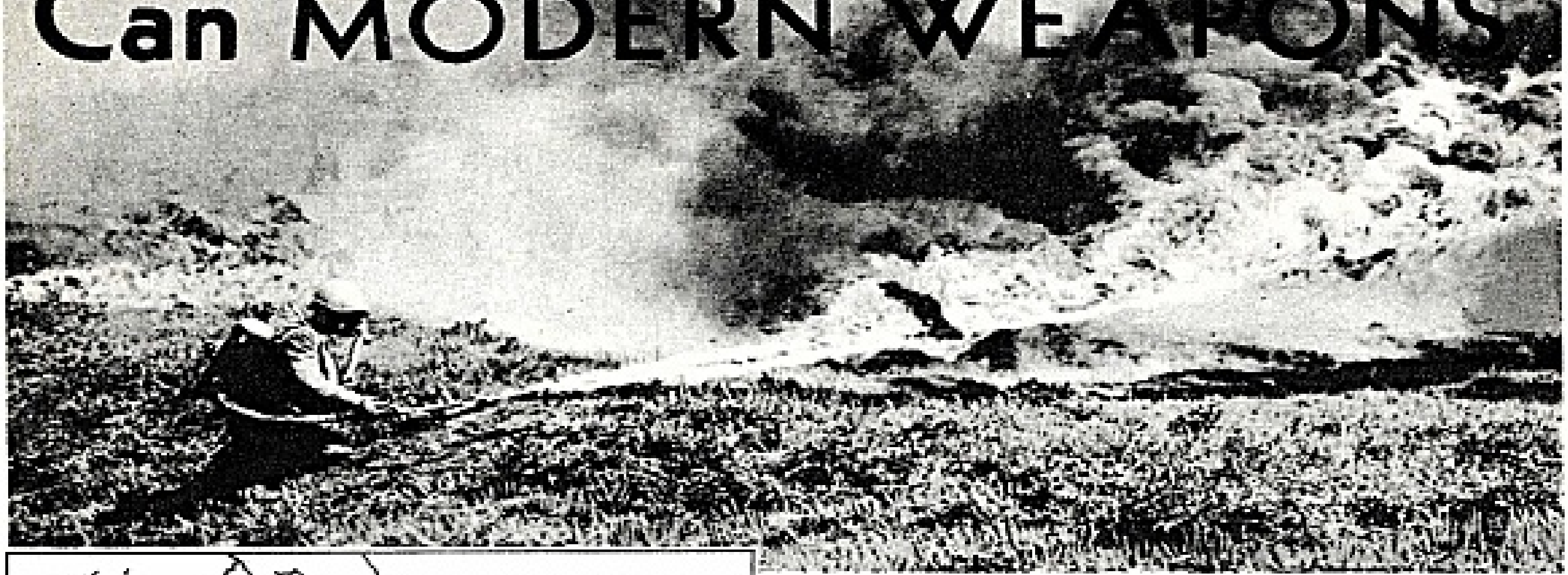


The greater the supply of water rushing through the gorge, the farther the inclined creek bed pitches it into space. The climb and drop dissipates practically all its force.

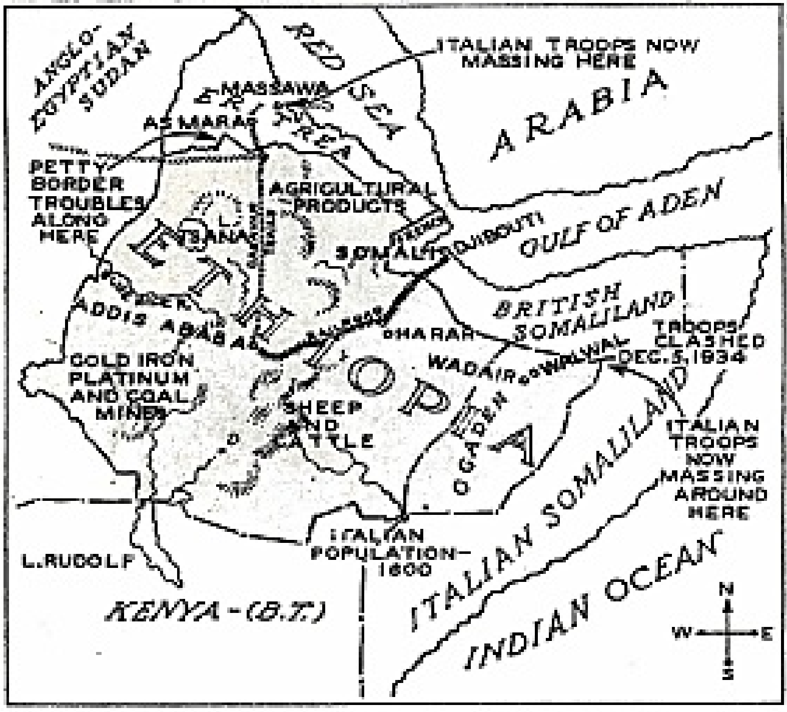


This concrete wing-walled channel saved $75,000 by eliminating two bridges. To the left of the new highway can be seen the row of trees marking the site of the original channel.

Can MODERN WEAPONS



Modern science contributes chemical fire to aid the Italian army, but overhead will be a fierce African sun to aid the Ethiopian tribesmen in battling the unacclimated invaders.


ANGLO-EGYPTIAN SUDAN
RED SEA
ITALIAN TROOPS NOW MASSING HERE
MASSAWA
ERITREA
ASMARA
ARABIA
PETTY BORDER TROUBLES ALONG HERE
AGRICULTURAL PRODUCTS
L. TSANA
GULF OF ADEN
SOMALI
DJIBOUTI
ETHIOPIA
ADDIS ABABA
BRITISH SOMALILAND
HARAR
TROOPS CLASHED DEC. 5, 1934
WADAIR
WALWAL
GOLD IRON PLATINUM AND COAL MINES
SHEEP AND CATTLE
OGADEN
ITALIAN TROOPS NOW MASSING AROUND HERE
ITALIAN SOMALILAND
ITALIAN POPULATION—1600
L. RUDOLF
KENYA - (B.T.)
INDIAN OCEAN
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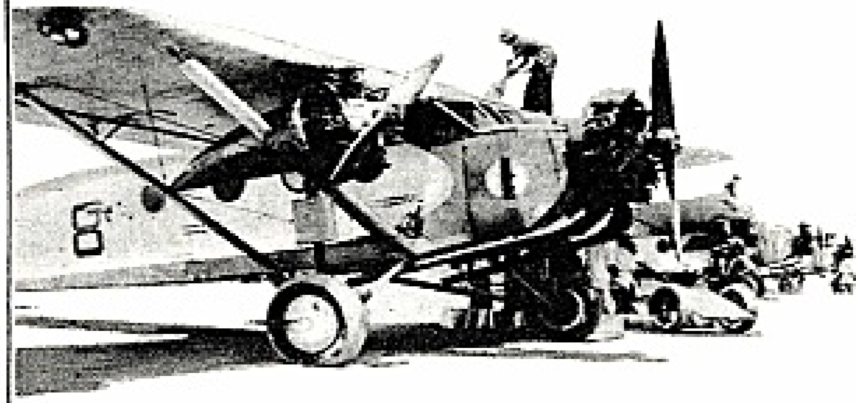
S

Ethiopia, with her vast mineral deposits and fertile plateau, effectively divides Italian Somaliland from Eritrea, Italy's other possession in Africa. Mountains form Ethiopia's forts.



These Italian planes, shown being overhauled after their arrival in Italian Somaliland, can attack swiftly, but Ethiopia is barren of landing fields and has few vital spots.

THE eternal battle between science and the elements will receive its supreme test in Italy's impending war with Ethiopia. Nature, which has enabled this oldest of kingdoms to maintain its independence against the inroads of the civilizing but exploiting white race, will be on the side of Haille Selassie's dusky warriors; and it is against nature that Mussolini's troops, armed with the latest death-dealing weapons, must pit themselves.

Italy already occupies two narrow strips of lowland bordering the Red Sea and Indian Ocean—Eritrea and Italian Somaliland. It took Italy seven years to conquer the former and twenty years to occupy the latter. The climate of both of these colonies is hot. They are steaming fever-ridden pest holes in the rainy season and almost waterless deserts in the dry. Of so little economic value are they that only 7,000 Italians reside there in normal times.

The highlands of Ethiopia, on the other hand, are fertile and temperate, and well suited to European habitation. Forming a barrier between the existing Italian colonies and the land Mussolini covets is, however, the Ogada district—an almost waterless, but rocky desert, 500 miles long and nearly 300 wide. This area is cut up with arroyos and crags, and is almost covered with a scraggly undergrowth so dense that it is seldom that vision can extend more than a quarter of a mile.

It is this vast Ogada desert, which Mussolini's troops must cross to obtain their objective, that has protected Ethiopia before, and upon which the warriors of the King of Kings expect to check the Italian hordes.

Conquer Ethiopia?

by
ROBERT W. GORDON

Bridges such as shown on left would be of no use to modern armies, though the tribesmen above, sworn foes of Italy, need nothing better. In the wilderness, spears, arrows, and savage instinct may defeat trained armies.

This country is absolutely without roads, railways, or water transportation, while every bush and rock can shelter a brown-clad Ethiopian. It was on this craggy plateau that Menelik massed 150,000 warriors to completely annihilate an Italian army of 12,000 at Adowa in 1896.

The Ethiopians are not organized as are European armies. Each tribal chieftain furnishes his own warriors upon call from Haille Selassie who can legitimately call himself the King of Kings because these minor kings accept him as their leader. Practically every man of the 3,000,000 Amharas is a fighter by choice and by habit, for the keeping of the seven million negroes and other lowland tribes in subjugation has given them continuous practice. These Amharas are of the Semetic race, closely allied to the Arabs and Riffs, long noted for their valor and love of independence. Every man has possessed firearms from his earliest childhood, and all are expert shots, with the frontierman's ability to find cover and to shoot only when every shot will be a hit. About 50,000 of the best of these have been trained in the use of modern weapons by Belgian officers.

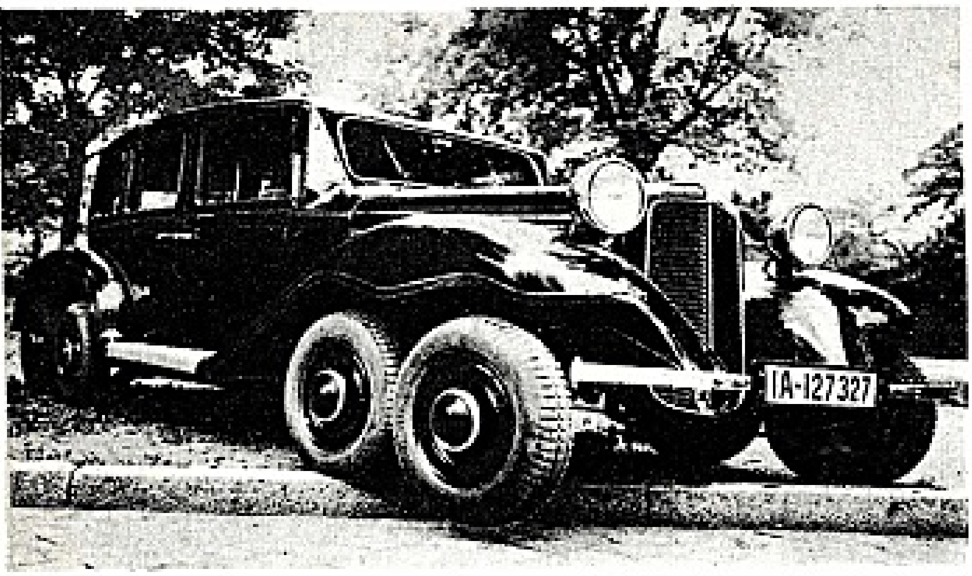
These barefoot Ethiopian troopers are well drilled in modern war.

The problem of supply for the Ethiopians will be minor. Operating in friendly territory, used to living on rations so meager that a European soldier would starve, eating his meat raw from choice, and with his women folks packing the few necessities on the family mule, the Ethiopian army will be absolutely independent of a line of communications, and will thus possess a mobility impossible to a modern army.

The Italian army, on the other hand, will be pitifully dependent upon keeping an unbroken line open to the rear—from the firing line to Italy. Food, clothing, ammunition, medical supplies, and even water, will have to be transported by truck, wagon or mule

[*Continued on page* 140]

8-Wheeled Car Doubles Riding Comfort and Safety Factors



Over bumps, curb stones or ordinary road obstructions, this 8 wheeled German car progresses with utmost smoothness. It is non-skidding, and 8-wheeled brakes add a new safety factor. The car has plenty of speed.

CAPABLE of reaching the highest speed with utmost safety, a new 8-wheeled car has made its appearance on the streets of Berlin, Germany.

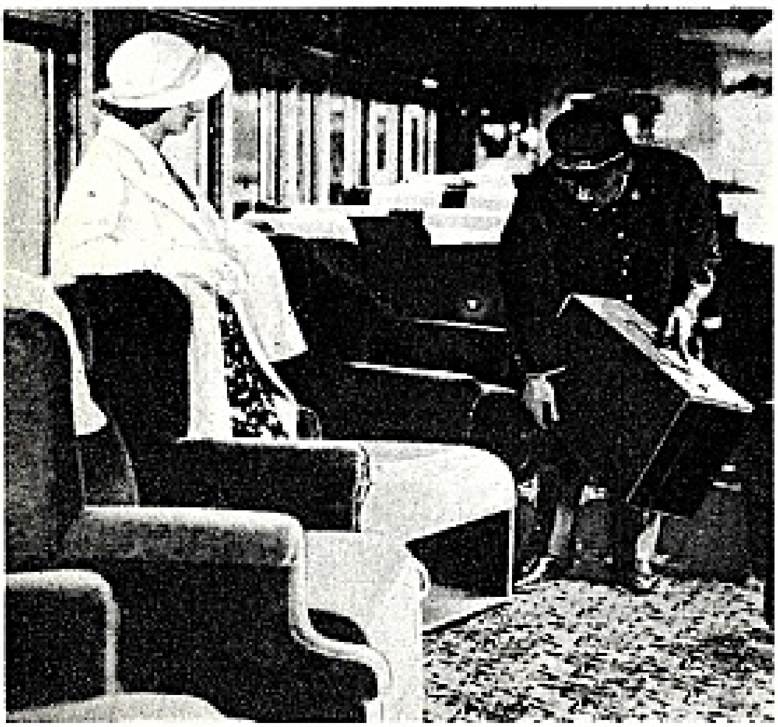
The four front wheels are connected by a series of tie rods so that they turn in unison, simplifying steering and making skidding practically impossible. Because of the more even distribution of weight, possibilities of a broken axle, wheel, or spring are reduced to a minimum.

With brakes on all 8 wheels, the car can be brought to a stop in about half the space required for a 4-wheeled car. Then, too, the eight points of contact with the road provide smooth riding even on the roughest thoroughfares. Graceful designing relieves the car of any appearance of awkwardness.

Traveler's Luggage Stored in Seat

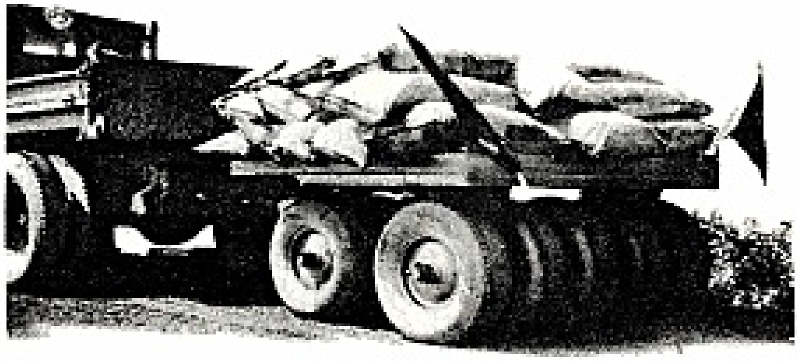
NO LONGER will luggage balanced precariously on overhead racks threaten to fall on the heads of parlor car passengers on Canadian railroads with the development of a luggage compartment built under each chair.

Taking advantage of the surplus space beneath each chair, which hitherto offered only a problem in sweeping, the railroads built in the luggage racks. The chair swivel is sunk in the car floor.



Safely out of the way is this luggage once it has been stored in the new seat compartments provided by the Canadian railroads. No overhead lifting is necessary.

Road Roller Has Pneumatic Tires



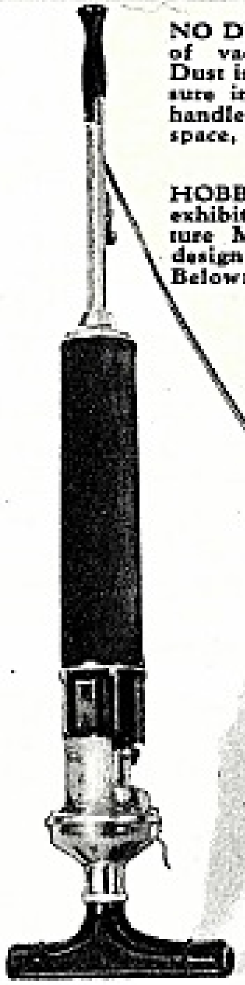
Seven tons of sand and steel weight down this pneumatic tired road roller, the latest thing in highway construction. Fresh oil does not stick to rubber tires as it does to steel.

DISPENSING with conventional steel rollers, a new type of road rolling machine is using closely spaced pneumatic tires weighted down by sand bags and steel punchings.

The unit is a trailer pulled behind any large truck, and has four wheels in front row and five behind. The width of the rear row is five feet, with the tires spaced to roll down the surface untouched by the front row. In addition, the back row fits evenly between the tracks left by the dual wheels of the towing truck. Thus the tires of the trailer roller and the truck form a solid path almost half the width of the road.

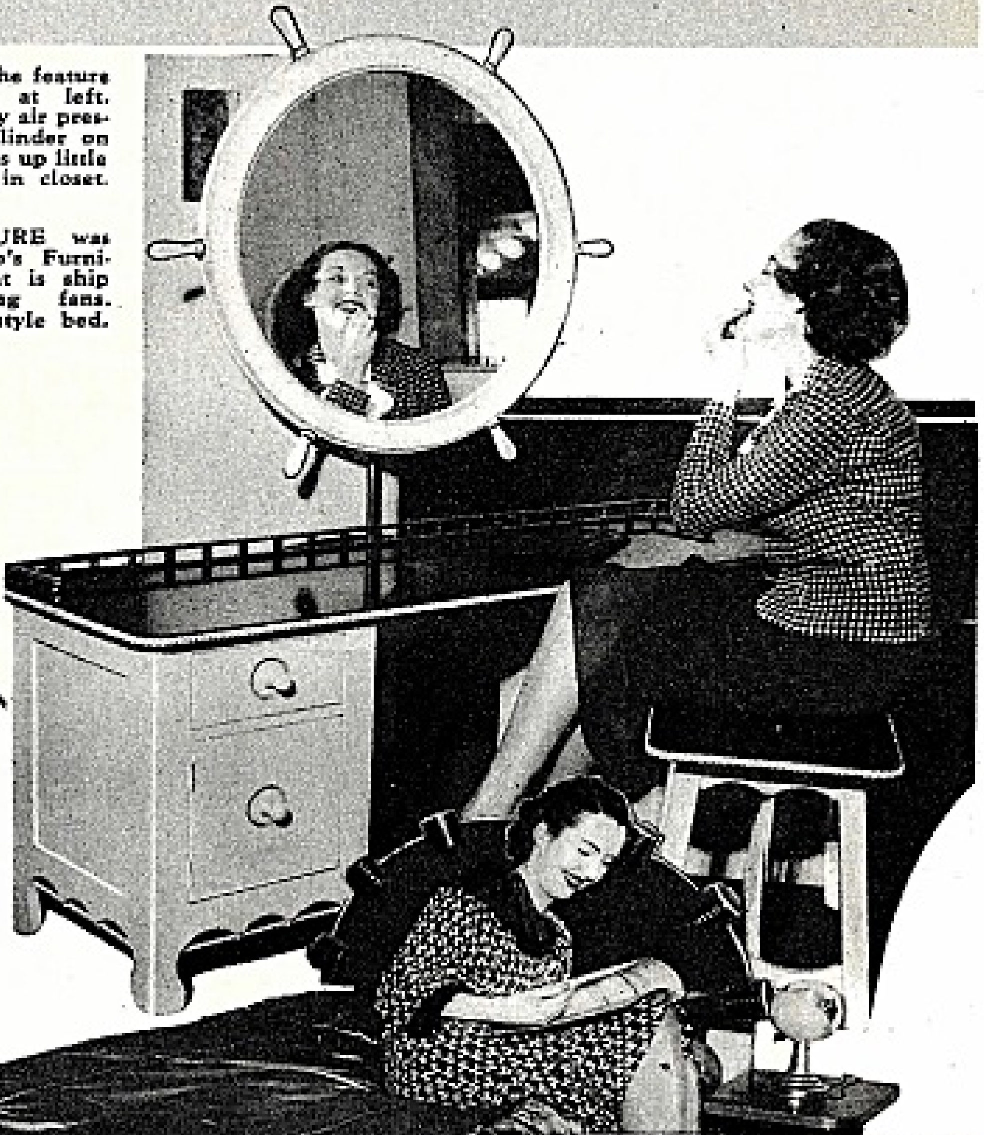
The roller is useful on oiled gravel roads as the oil does not stick to the tires.

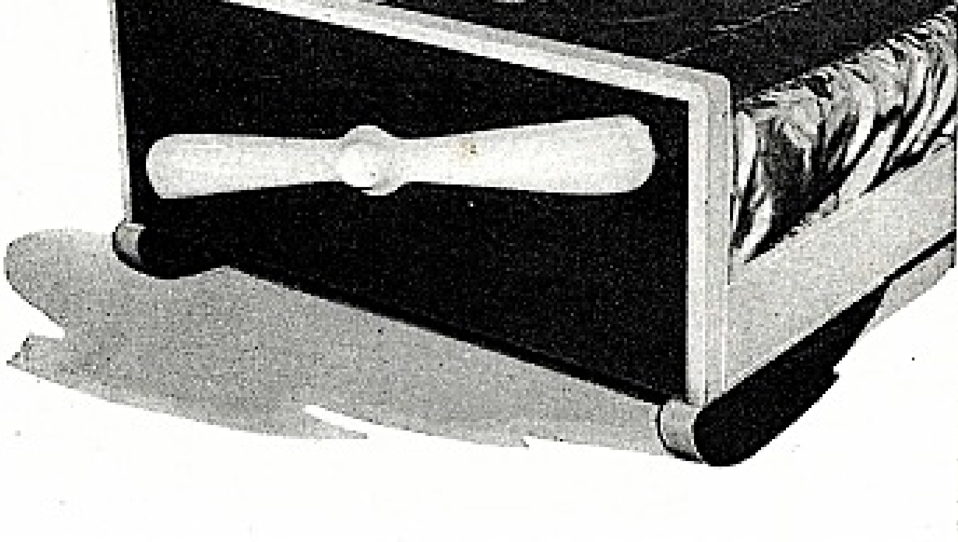
Your HOBBY Sets FURNITURE STYLE, *Latest Idea In New Home Appliances*

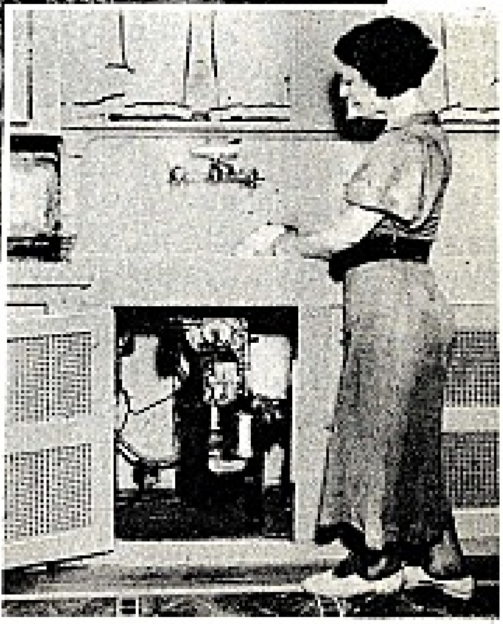


NO DUST BAG is the feature of vacuum cleaner at left. Dust is compressed by air pressure into bakelite cylinder on handle. Cleaner takes up little space, can be hung in closet.

HOBBY FURNITURE was exhibited at Chicago's Furniture Mart. At right is ship design for boating fans. Below: an aviation style bed.







GOOD-BYE GARBAGE PAIL is assured with electrical device at right installed under kitchen sink. Garbage is disposed of through drain pipe of sink. Device grinds all waste material so that it can pass through home sewage system. Grinder, driven by ¼ h.p. electric motor, is used about 5 minutes a day.

Radio Amateurs to the Rescue

CQ CQ CQ QRR QRR QRR

Radio amateurs more than 10,000 miles away anxiously listened for CQ's (general inquiry call) from this station. Guy Hutcheson is the operator at the set which went to the Antarctic with Admiral Byrd's second expedition. Amateurs handled messages from Byrd's men to U. S. relatives.

During disasters radio "hams" come to the rescue. They keep in touch with lonely outposts, with explorers, and like sentinels in the night guard against death.

WHEN a roaring hurricane swept through Florida in September, unknown amateur radio operators became heroes in the midst of death and destruction. Through howling wind and pelting rain they tapped away on their low-power transmitters when telephone, telegraph, and powerful broadcasting stations failed.

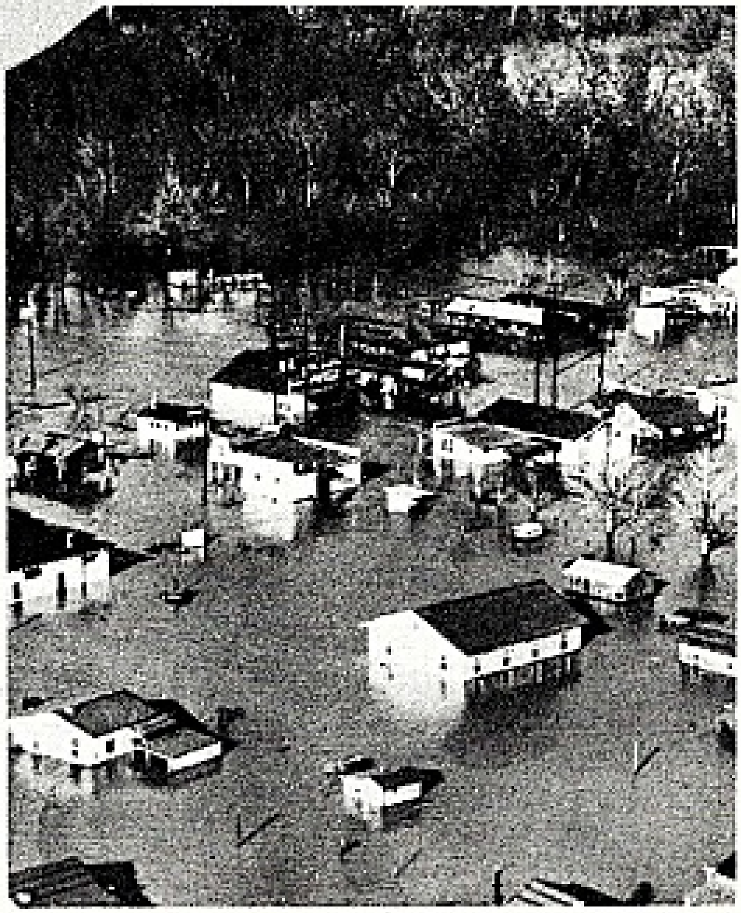
Their dots and dashes—the language of the radio amateur—hurtling through the ether flashed to the rest of the world news of the disaster and set the great task of relief into motion.

For twenty-three hours, while buildings crashed around him, Fred E. Bassett, Jr., of Eustice, Fla., described scenes of horror and gave directions for relief over his 50-watt portable transmitter, W4AKI.

In Miami, Alonzo O. Bliss, Jr., operator of W4COT picked up the messages and relayed them to Red Cross and army relief workers. Other amateurs in the hurricane area also carried on heroic work wherever it was possible to erect emergency transmitting equipment.

Death by storm, flood, earthquake, and disease is foiled by the ever-watchful radio amateurs. When other means of communications fail, they leap into the breach. Their emergency call, QRR, often restores the link of intelligence over which the work of relief and reconstruction is carried on.

All amateurs are advised to have emergency equipment in readiness for disaster. In the upstate New York flood last July amateur radio stations again came to the rescue. They sent out messages from survivors to anxious relatives outside the flood stricken area. They hunted down missing persons, lost transport planes, and sent out descriptions of road and bridge conditions in their vicinity, so that relief parties could reach the injured and marooned as quickly as possible.



DeSoto, assistant to the secretary of The American Radio Relay League, relates in accompanying story how amateurs assisted in rescue work in last summer's midwest floods.

in FLORIDA HURRICANE

by CLINTON B. DE SOTO

When floods isolated many Nebraska towns early last summer destroying communication by telephone or telegraph, five radio amateurs, Lewis Cook, A. L. Cook, Bob Mitchell, Milan Kinsey, and Brick Early, loaded the transmitting and receiving sets of station W9FWW and the portable equipment of W9EKK on a truck and set out for the stricken area to aid in the rescue work.

At Pettygrove one of the stations was rigged up and stayed on the air continually for four days and nights handling important messages. The portable station was picked up by an airplane and flown to a hill near Oxford to establish the only means of communication in the flooded area. Later an airplane dropped a tent and other equipment to the amateurs during their long vigil.

Last spring a sleet storm swept down on Duluth, Minn., on the western tip of Lake Superior. The entire city was isolated. Lights, telephones, telegraph, radio broadcasting stations, all were made useless as hundreds of telegraph poles crashed under the weight of the sleet. Radio amateurs in the city immediately offered their assistance. They reached the outside world through fellow amateurs in Wisconsin and in Minneapolis and St. Paul.

Top—Wreckage of 1931 New Zealand earthquake in which amateurs did heroic work. Right—James H. Leach, operator of station W9BN, one of the amateurs that established communication with Duluth through W9ASQ where T. O. Jorgenson used dry cells when power failed.

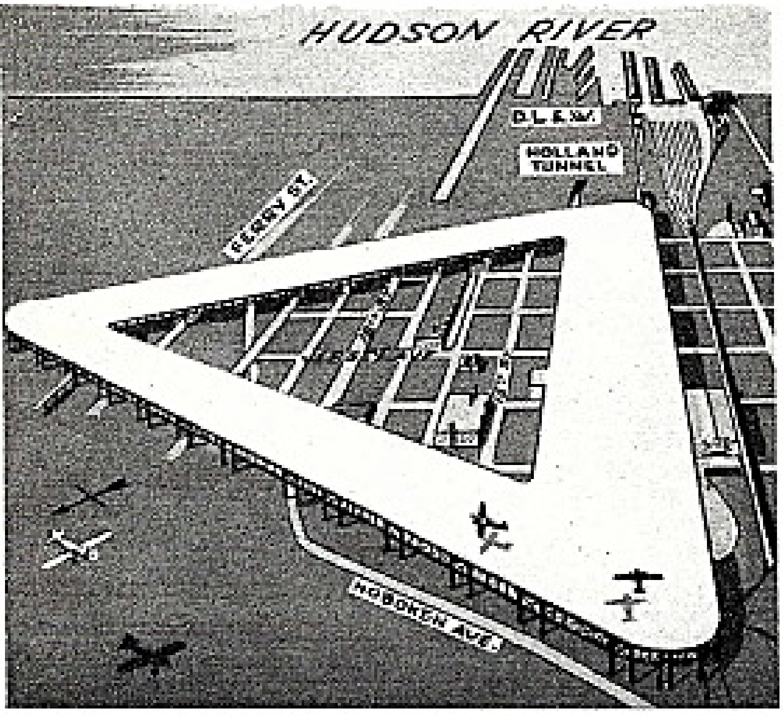
Amateurs saved Duluth, Minn., from complete isolation when this sleet storm tore down all communication lines. They handled traffic for police, newspapers, railroads, business.

These amateurs aided railroad dispatchers in locating trains which were traveling through the area without orders in danger of serious accident; they sent out emergency calls for police and sheriffs; carried news bulletins for the press associations; and cleared important messages of the business and industrial world.

Not long ago from remote Alitak, an Alaska amateur radio flashed the urgent plea to save a life. In Seattle, early that Thursday morning, Ed Stevens, owner of amateur station W7BB, heard the call for help. He engaged

[*Continued on page* 138]

Airport Planned For Heart Of City Would Rest On Stilts


HUDSON RIVER
D.L.&W.
HOLLAND TUNNEL
FERRY ST.
HOBOKEN AVE.

This airport on stilts, to cost $32,000,000, is being considered by the Jersey City Commission as a means of reducing time between airport and city. It would be centrally located.

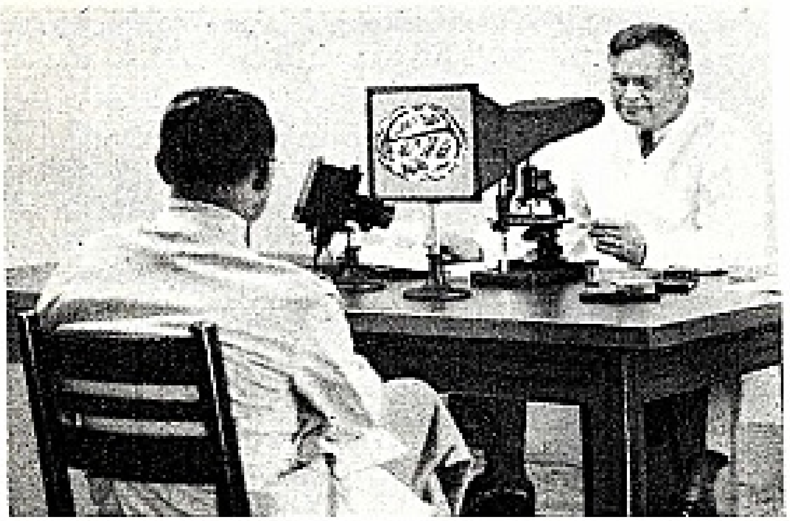
REASONING that nothing was gained if travelers saved an hours' time commuting by airplane, only to waste it in getting from the airport to the city, the Jersey City Commission is considering plans for a $32,000,000 airport in the heart of the city as a means of making air travel fast in fact as well as in name.

The airport, as planned by Alexander Simpson, former New Jersey state senator, would rise 150 feet above the street level, with runways 500 feet long, arranged to form a triangle with 4,000 feet of clear length.

The airport would also provide a convenient landing for New York bound passengers who would have only the Hudson river to cross to reach their destination. Surface traffic would be unimpeded by the structure, while life in the buildings below would continue as before.

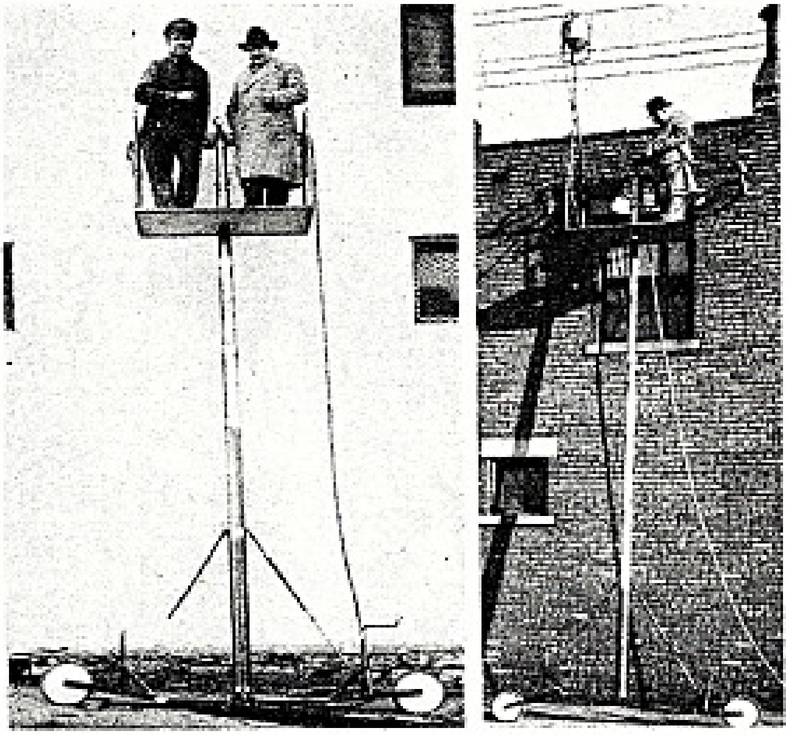
Euscope Is Boon To Microscopy

COMBINING three distinct purposes, the newly perfected Euscope, when applied to any standard microscope, permits individual observation of the slide with both eyes, facilitates photo-micrography, and projects a greatly enlarged view of the specimen upon a screen for class-room observation. The microscope is first focused on the specimen, then the Euscope is placed over the eyepiece and the image focused on the screen. A camera replaces the screen for photo-taking.



The image reflected upon the screen of this Euscope is that of a specimen beneath the microscope. Laboratory workers or students can study slides without strain by this method.

Painter Invents Portable Elevator



This is an outdoor elevator, invented by Fred Bird of Kansas City when he got tired of climbing extension ladders. These two views show the compressed air ladder in actual operation.

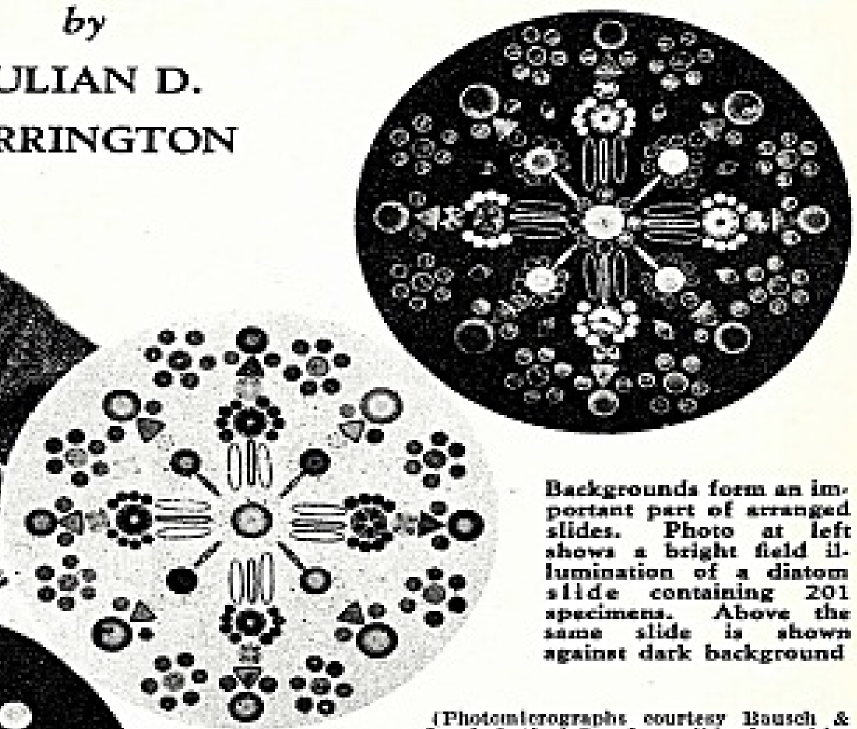
WHEN Fred A. Bird, Kansas City, Mo., painter got tired of climbing extension ladders in pursuit of his occupation, he temporarily turned to invention. The result is the air ladder, an outdoor elevator which whisks him and his paint platform up the side of a building at the turn of a compressed air valve. The sections of his ladder shaft telescope one within the other.

Arranged Slides are Jewels of Microscopy

by

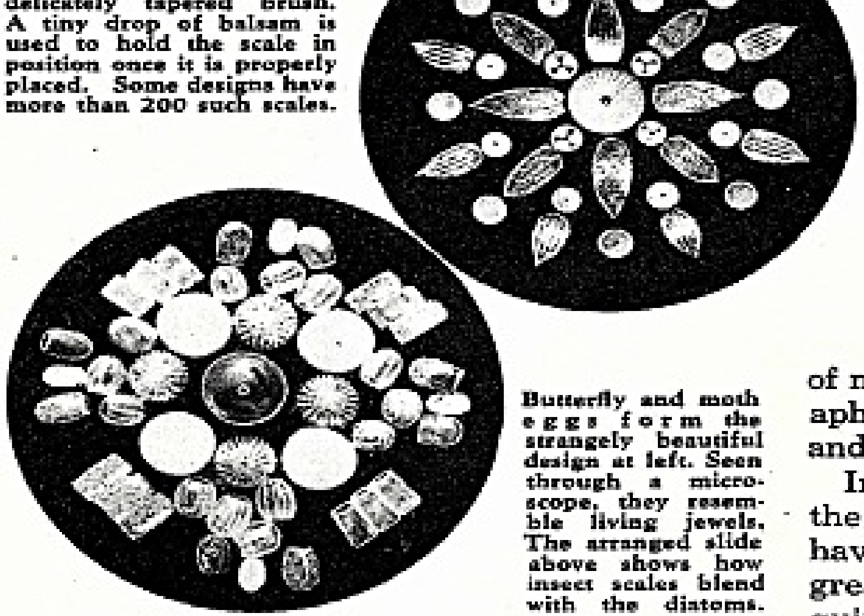
JULIAN D. CORRINGTON

Dr. Corrington is shown here as he mounts a single butterfly scale which is adhering to the tip of his delicately tapered brush. A tiny drop of balsam is used to hold the scale in position once it is properly placed. Some designs have more than 200 such scales.



Backgrounds form an important part of arranged slides. Photo at left shows a bright field illumination of a diatom slide containing 201 specimens. Above the same slide is shown against dark background

(Photomicrographs courtesy Bausch & Lomb Optical Co., from slides loaned by Ward's Natural Science Establishment)



Butterfly and moth eggs form the strangely beautiful design at left. Seen through a microscope, they resemble living jewels. The arranged slide above shows how insect scales blend with the diatoms.

THE beginner in microscopy delights in mounting insect legs while the more advanced worker is equally absorbed by the intricacies of sectioning. But your real dyed-in-eosin enthusiast is not satisfied until he has done at least one arranged slide. And having achieved one he naturally goes on to more. What are these slides and how are they made?

Arranged slides fall within a class generally dubbed exhibition slides. First of all, the subject must be interesting. Next, it must incorporate unusual elements which place it beyond the ranks of the commonplace, such as an elaborate or exacting technique, or the opportunity for demonstration of a considerable skill.

Favorite objects which can be placed in the form of definite patterns in the execution of such slides are diatoms, butterfly wing scales and insect eggs. Others, equally serviceable, but more difficult to manipulate are wing covers of minute beetles, such entire small insects as aphids, lice and fleas, mites, scales of fishes and reptiles, and the pollen and seeds of plants.

In general, the more intricate the design, the smaller will the individual components have to be; the smaller these elements, the greater the degree of manipulative skill required; and the finer the detail, sculpturing, markings and more beautiful the form and color of the separate units, the more fascinating the finished product.

From the foregoing it may be seen at once that the beginner in this art of the microscopist is best advised to start with relatively large and easily handled objects, and to stick to a simple design.

Designs fall within two categories, either geometrical or pictorial, the former being the easier and as a rule the more striking and beautiful. Squares, circles, diamonds, triangles and stars may be used singly or in combinations, as seen in some of the ac-

[*Continued on page* 130]

How to GUARD

Above—A dog enjoys tricks, and exercise is one of the best health measures for him. Right—Regular bathing not only keeps the dog in trim, but prevents infestation with fleas which carry worm eggs and sometimes cause the dog's death.

YOUR dogs' health is your concern, if you value him at all. He has no way of telling you when he is ill. Quite often he will force himself to play or follow your whims when he is actually seriously ill.

To give a complete diagnosis of each disease or attempt to prescribe a cure would hardly be possible in a limited space, but some of the symptoms of various diseases should prove helpful to the dog owner. If you feel that you have diagnosed your dog's case, you will find on the market a standard remedy for nearly every ailment. These remedies can be obtained in most drug stores and pet shops and are usually reliable when used according to directions. If there is any doubt in your mind as to the dog's ailment, do not fail to consult a veterinarian.

Worms no doubt are one of the greatest enemies of the dog, and especially the puppy. Most dogs have them at one time or another. There are several kinds of worms namely, the round worm, hook worm, whip, and tapeworm. The round worm is generally prevalent in puppies. A puppy will become listless and inactive, though he may eat voraciously. The necks and legs of worm-infested puppies are thin and their bowels are irregular. A diarrhetic condition may also be present. Vomiting is also a symptom. Invariably the eyes will contain matter.

Hook worms are thread-like in appearance and are about one-half of an inch long. They firmly attach themselves to the lining of the small intestines, which causes a slight bleeding. Puppies are very susceptible to these worms, especially in the South. Usually the appetite is good, the coat is rough and dull, and the skin may be scaly and reddened. There may be a cough and discharge from the nostrils. The dog becomes weak and emaciated and death soon overtakes him, un-

Your Dog's Health

by EARL CRAIG

If you value your dog and do not want to lose him, know the symptoms of diseases which endanger his life. The common ailments to guard against are covered in this article.

less he is given the proper care immediately.

The symptoms of whip worm, are similar to the others. The whipworm getting its name from its resemblance to a whip. This worm is from 1½ to 3 inches in length and usually can be readily detected in the droppings.

The symptoms of tapeworms vary considerably in the dog. Some may be infested with worms yet not lose flesh, but as a result suffer from eczema, which disappears when the worms have been expelled. As a rule a dog eats well, but has that tucked up appearance.

Tapeworms do not breed in the dog. The eggs or larvae must pass out of another dog already infested and be carried to another dog by an intermediate host. In the intermediate host they developed into cysts or bladder worms, and, if these in turn are swallowed by the dog, they develop into a tapeworm, therein completing a cycle. Fleas and lice act as intermediate hosts, hence the importance of keeping the dog free from these pests.

Several of dog remedy companies now have on the market worm medicines that rid the dog of nearly all worms at the same time.

If every dog owner would worm their puppies at least every two months until the age of one year, and then twice yearly, they would be well repaid.

In many cases dogs infested by worms have developed convulsions and running fits, frothing freely at the mouth, snapping at anything in their path and running blindly into objects. Usually the cry of mad dog is broadcast and the dog is killed. Proper worming would have saved him from an unnecessary death.

Running condition or lack of life in the eyes is a sign of ill health. Know your dog's features and expressions to recognize change.

The hunched, cramped appearance of dog at right is a sign of tapeworm. Often eczema appears in worm infested dog. Fleas carry the worms.

There are two forms of mange, sarcoptic and follicular. Both are caused by parasites and are very contagious.

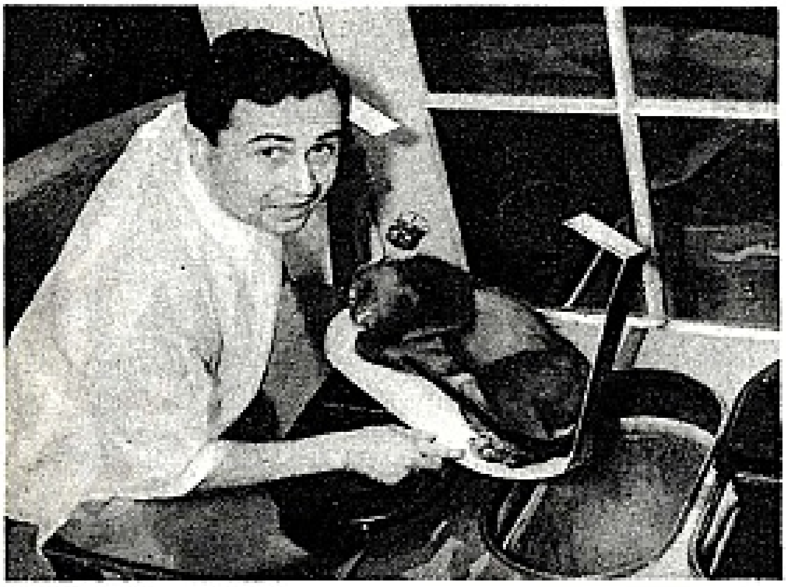
Sarcoptic mange is the most common form of this skin disease and is recognizable by its scales or scabs on the skin.

Follicular mange differs in that the parasite buries itself in the skin of the animal and follows the hair follicles. The disease is slower in development, but gradually round bare spots appear over the body. Due to the deep burrowing of this parasite, the disease is usually incurable.

Eczema is a common skin disease and is more prevalent in long-haired dogs in the summer time. It is usually caused by im-

[*Continued on page* 118]

"Frozen Death"—Is It Fact or Fantasy?



Dr. R. S. Willard is shown above with monkey which he claims was revived after three days of the "Frozen Death." He hopes his process will cure tuberculosis and cancer.

WHILE medical societies cried "fake," and public spirited citizens wrote hundreds of letters of protest or encouragement, Dr. Ralph Willard, 32-year-old research chemist of Hollywood, Calif., calmly continued his five years of experiments with the "Frozen Death" which he hopes will be culminated with the revival of a frozen human being.

Nationwide publicity was turned on Dr. Willard recently when he claimed to have revived a Rhesus monkey after it had been pronounced dead and frozen stiff for three days in an ice chamber. Doctors protested that a live monkey had been substituted.

According to Dr. Willard, he placed the monkey under ether, injected a series of saline solutions into the blood stream to prevent coagulation, and then doused the animal's head in carbon dioxide to produce instant freezing of the brain tissues. Ten seconds later, a 20-pound blanket of liquid air froze the body stiff, and it was placed in the ice chamber for 3 days. To revive it, he placed it in a warming compartment for 10 hours, and then injected another series of fluids, adrenalin, interior and exterior pituitary fluid, and ex-hormone pituitary fluid. Oxygen was administered, and the monkey moaned feebly. Within a few minutes, it was "back to life."

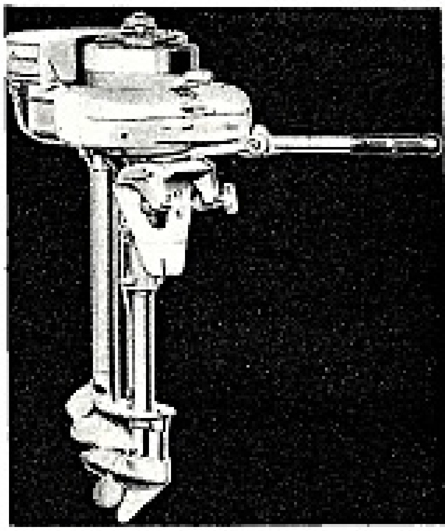
New Finder Gets Radium Program

OF ALL the precious minerals, radium has the greatest propensity for getting lost. Hospitals annually lose thousands of dollars worth of the valuable substance, and as a result, hundreds of devices have been invented for its recovery. A radium receiving set, invented in England, is the latest. It consists of a long tube, connected by means of an intricate electrical mechanism to a set of head phones. When the tube nears radium, no matter how small the bit may be, it transmits a clucking sound to the headphones.

This is a radium receiving set. When the tube held by the operator, above, nears a vial of lost radium, it sets up a clucking sound in the earphones, a true radium program.

1936 Outboard Sets High Standard

NEW cruising luxury is incorporated in the 1936 model outboard motors, the first of which are now being introduced on the market. On one model of popular make, a 4.4 horsepower twin motor, the carburetor and electrical system are enclosed beneath a metal hood. Rubber mountings float the motor so that no vibration is carried into the boat. The weedless propeller has a rubber cushioned drive, and the steering handle is shockproof.

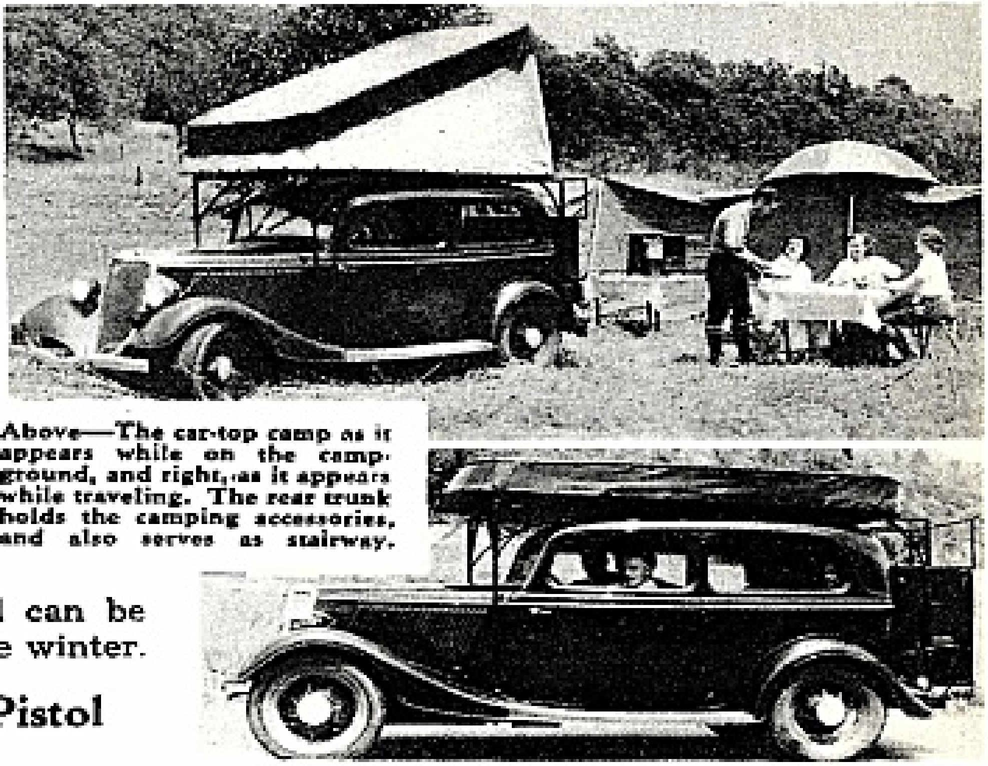


This outboard motor has hooded power, rubber mountings, vibrationless steering and other features.

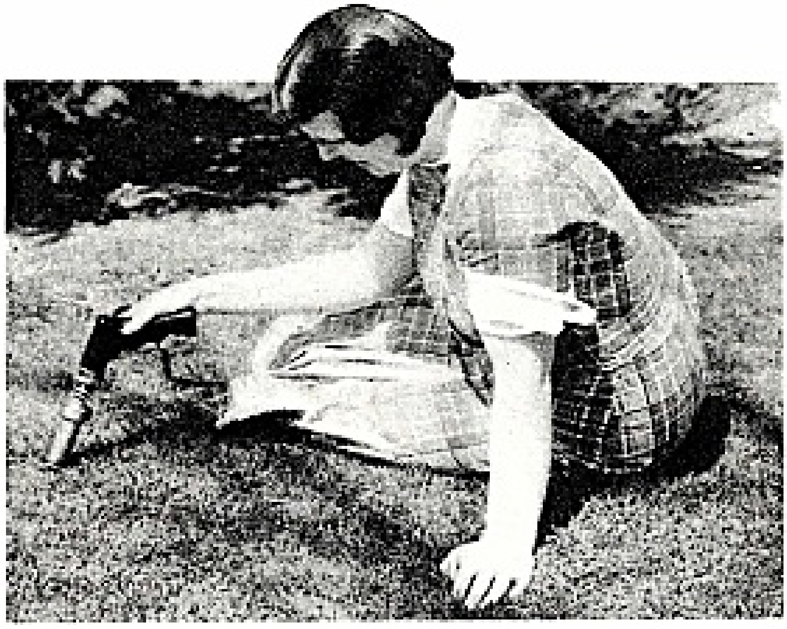
Car Top Becomes Camp Ground in Latest Outing Equipment

YOU carry your camping spot with you when you carry the latest development in camping equipment, a tent which is pitched on the top of the car. When not in use, the tent collapses into a space the size of an average mattress, and remains on top of the car when traveling.

A stairway fastened to the rear of the car like the stairway on a double deck bus provides easy entrance to the tent. The rear trunk, which also serves as a stepping platform, contains all the necessary camping equipment, including a 30-foot canvas windbreak. The outfit fits any car, and can be stored overhead in the garage for the winter.


Above—The car-top camp as it appears while on the campground, and right, as it appears while traveling. The rear trunk holds the camping accessories, and also serves as stairway.

Weeds Shot With Electric Pistol


This is the latest weapon devised in the war against weeds, a pistol that electrocutes its victims. The point is jabbed into the weed's tap root, and electricity sears the plant down.

WEEDS that mingle with the lawn grass have long proven obstinate foes to combat, yielding to most garden instruments only at the expense of considerable turf. Now, however, a new weapon has been devised which electrocutes them instantly.

The weed electrocutor is built like a pistol, the barrel of which terminates in a sharp point. The point is jabbed into the tap root of the doomed weed, and a charge of electricity is released when the trigger is pulled. As the electric current is confined to the point only, the instrument is perfectly safe.

Processed Linen Suits Shed Water

NO LONGER need the unexpected summer shower spell ruin for the well-dressed men if he is clad in a linen suit made showerproof by a new laundrying process.

The process was developed by a New York City laundry after much experimentation. Linen suits after treatment actually shed water like a duck's back. Where a light sprinkle of rain would reduce the untreated suit to a shapeless mass of wrinkles, the treated suits come through without loss of press.

SODA - CANDY
CIGARS - STATIONERY
A shower bath from a New York sprinkler leaves the press in this linen suit just as sharp as ever. The suit has been treated by a new process, and is as water proof as the duck.

THREE MILES DOWN

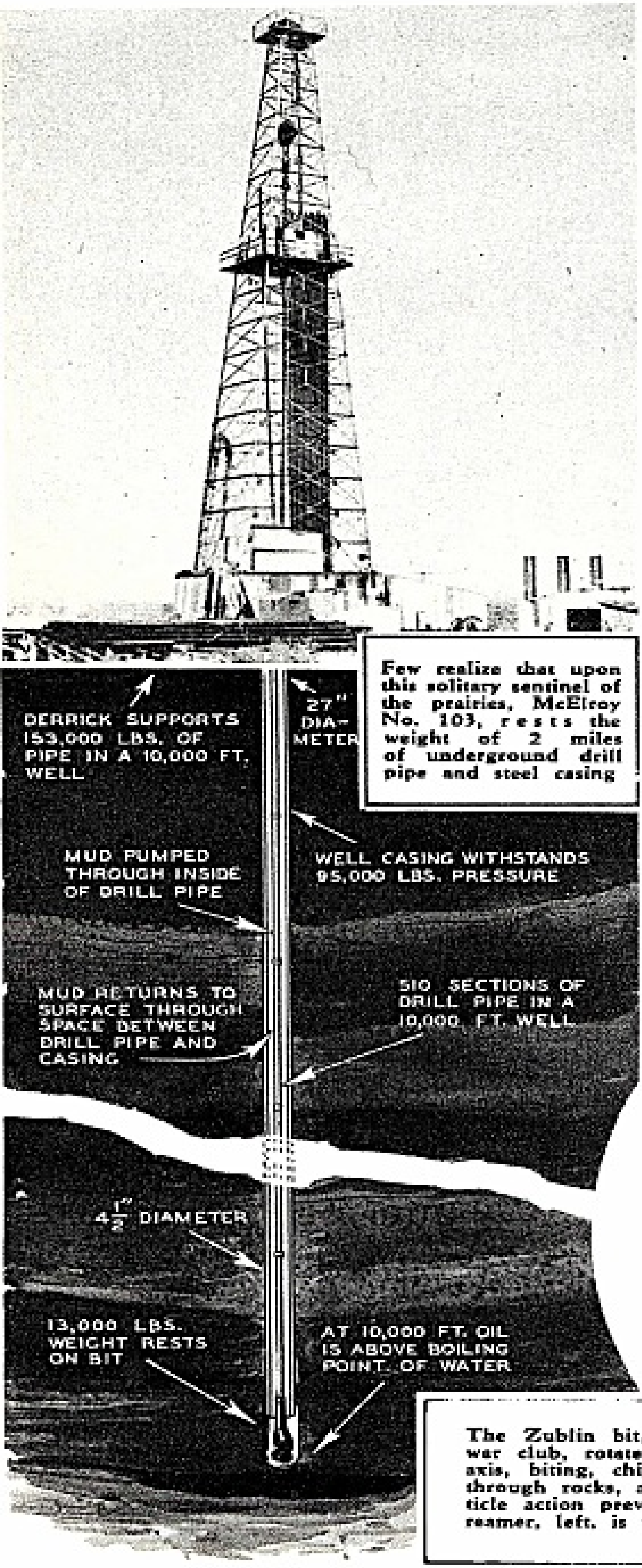
by KENNETH ERLING

THIRTY-FIVE thousand times longer than its diameter, a steel drill pipe snaked its way down a thin hole in Crane County, Texas, until the bit in McElroy No. 103 well bored into rock 12,786 feet below the earth's surface —newest and deepest hole drilled in the world-wide race to discover new oil fields.

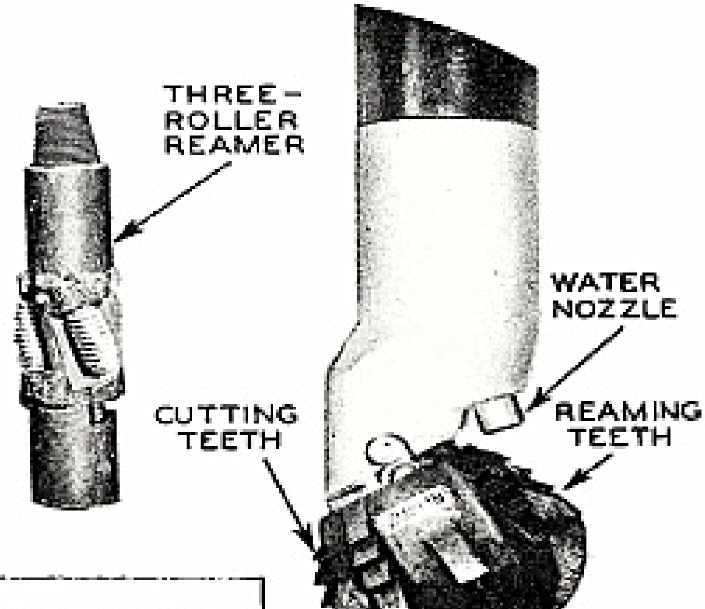
Records fell as the bit pushed on into oil sands never before penetrated. Into the first well to be drilled below 12,000 feet, McElroy No. 103, was run and cemented the longest string of pipe in the world. From its bottom came a core sample, two inches thick and a foot long, which gave geologists their first view of the earth's rocky interior nearly 2½ miles below the outer crust. During two years of drilling, at a cost approaching $400,000, not a major casualty resulted to delay operations.

Every year the bit goes deeper in the quest for black gold. Today 13 holes penetrate the earth 10,000 feet or deeper, seven having been drilled during the last two years.

Convinced that oil fields of the future underlie those of today, petroleum engineers everywhere are engaged in the race of deeper and deeper drilling. All sorts of physical and chemical tricks and mechanical novelties enter into deep drilling. Although the bit


DERRICK SUPPORTS 153,000 LBS. OF PIPE IN A 10,000 FT. WELL
27" DIAMETER
MUD PUMPED THROUGH INSIDE OF DRILL PIPE
WELL CASING WITHSTANDS 95,000 LBS. PRESSURE
MUD RETURNS TO SURFACE THROUGH SPACE BETWEEN DRILL PIPE AND CASING
510 SECTIONS OF DRILL PIPE IN A 10,000 FT. WELL
4½" DIAMETER
13,000 LBS. WEIGHT RESTS ON BIT
AT 10,000 FT. OIL IS ABOVE BOILING POINT OF WATER

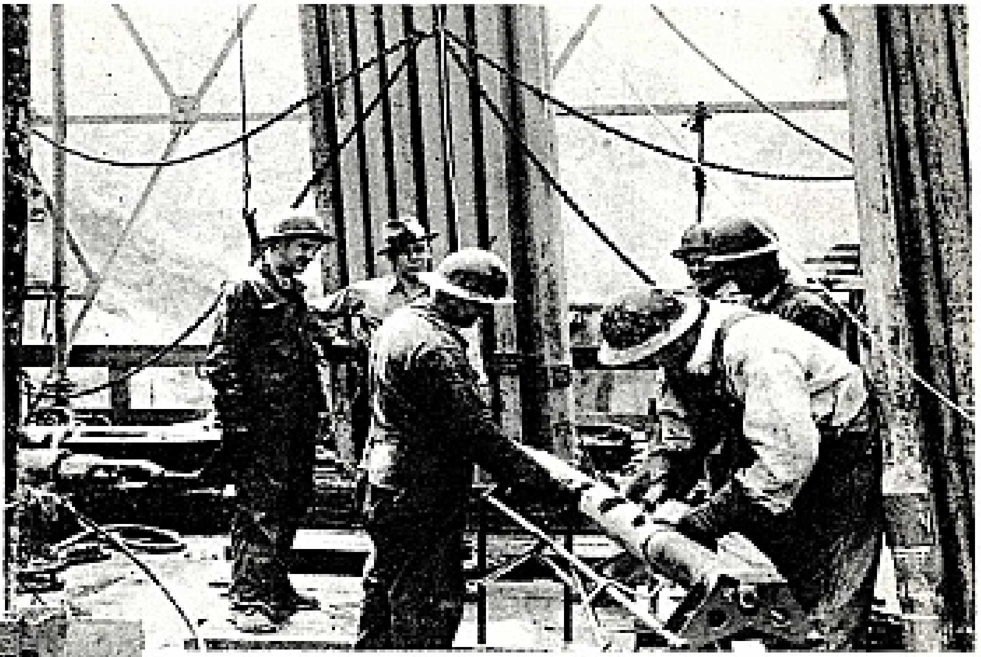
Few realize that upon this solitary sentinel of the prairies, McElroy No. 103, rests the weight of 2 miles of underground drill pipe and steel casing


THREE-ROLLER REAMER
WATER NOZZLE
CUTTING TEETH
REAMING TEETH

The Zublin bit, resembling an ancient war club, rotates and oscillates on two axis, biting, chipping, reaming its way through rocks, and even steel. Its verticle action prevents side drifting. The reamer, left, is used with fish tale bits.

in Search of BLACK GOLD

The future of present industrial methods may be three miles miles down in the bowels of the earth. As our oil supply dwindles, men go deeper in quest of the vanishing liquid wealth.



These oil workers are loading an underground cannon, preparatory to bringing in a well. The weapon is lowered to the bottom of the hole and detonated. High velocity steel bullets are discharged through the side perforations.

The fish tail bits of varying sizes shown here are used with rotary drills, and bore into rocks much like giant post hole augers. Reamers follow to keep the hole straight.

turns 200 times a minute two miles or farther down from the drill table, science gives the drilling crews accurate mental pictures of conditions throughout the depth of a hole.

Streamlined drill pipe and casing speed operations and reduce normal hazards. Recording thermometers reveal temperatures on the bottom. Clays and chemicals mixed with mud used to lubricate the bit and drill pipe and return cuttings to the surface perform feats of wizardry.

No matter how deep they go, holes are driven within a few feet of the desired place by use of delicate surveying instruments and deflecting devices. Electrical corers and loggers and movie cameras write the histories of all deep wells as clearly as though man could see the formations through which the bits bite their way to world record depths.

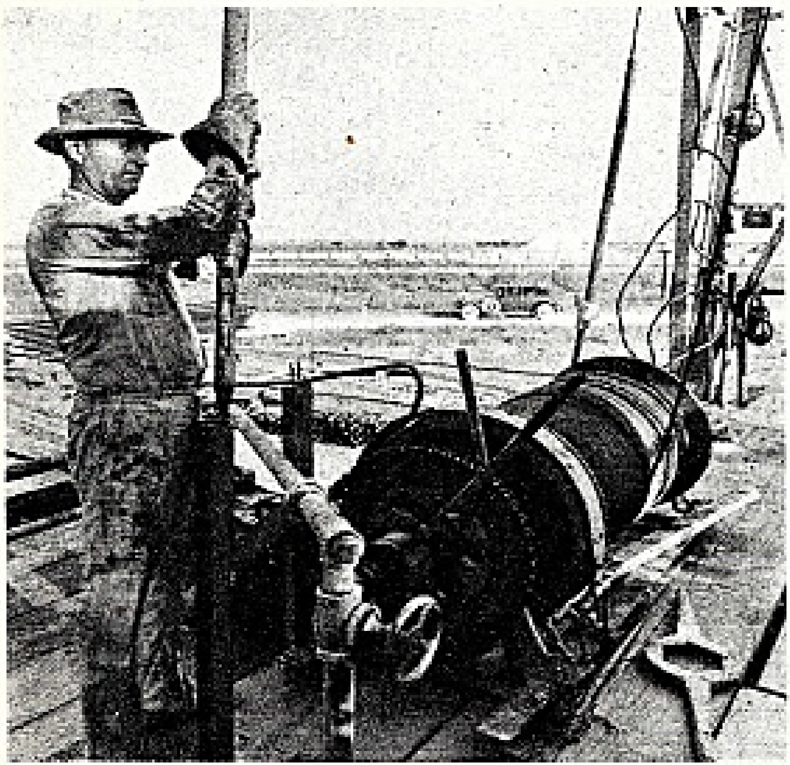
As the bits dig deeper into the earth they encounter tremendous pressures, caused by the weight of the earth's crust on rocks below, and heat which rises above the boiling point of water. Yet skilled crews keep the bits turning at the bottom of thin columns of mud, until at last samples of sand and rock reveal they have reached a new producing horizon.

Whenever a bit penetrates an oil-bearing sand deeper than any yet reached, a potential new oil field is discovered. Every one of the 13 deep holes has uncovered a new "field," despite the fact none of these was started with the intention of reaching new depths. They take on great significance, however, in view of the declaration of Prof. John F. Dodge of the University of Southern California, that, "present flush fields soon will become exhausted."

These deep holes are drilled by the "hydraulic rotary" process. This means that they are actually bored, much as an auger eats a hole through a piece of wood, by a bit suspended below a round table turned at varying speeds by steam, electricity or compressed air. As the drilling progresses ever deeper, the well must be kept "alive." This involves the hydraulic element.

The drill pipe to which the bit is attached turns inside a larger casing, made of tough steel. Mud is pumped down inside the drill pipe under high pressure, flows out through the bottom and returns to earth in the space between the drill pipe and casing. On its return journey the mud brings up cuttings ground away by the bit.

MEN DRILL On At BOILING Temperatures

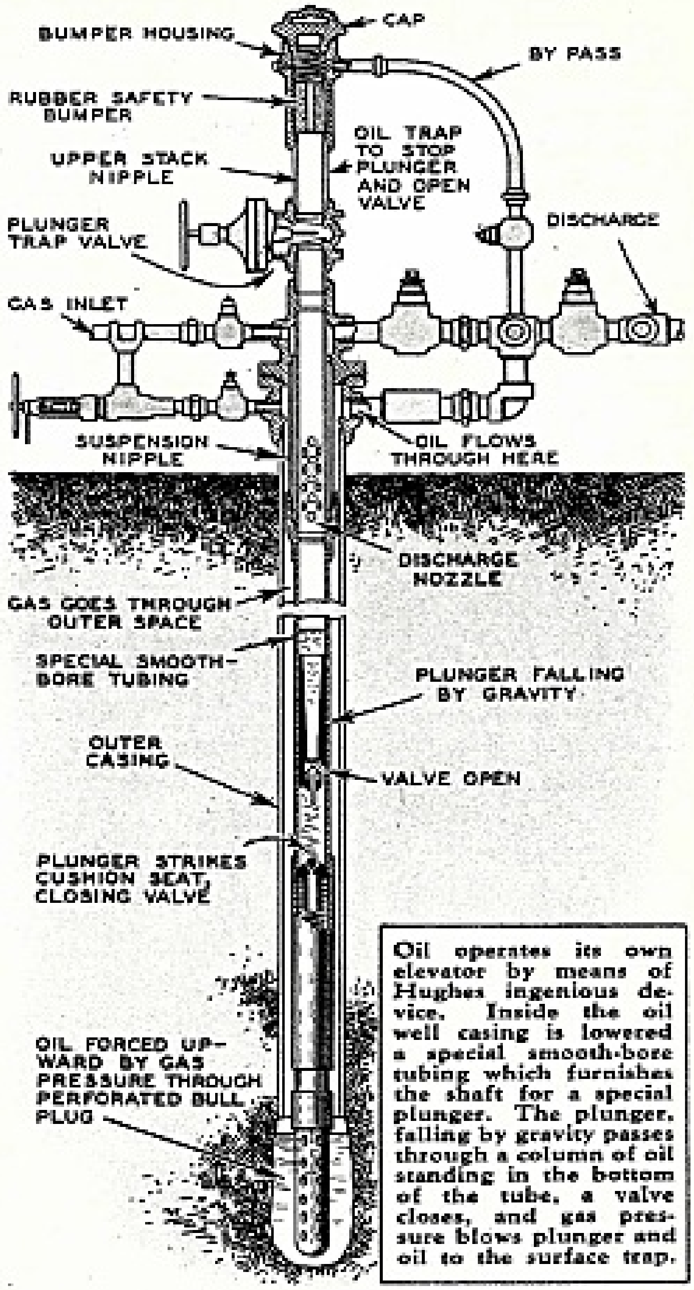


Specimens of rock formations from 2 miles beneath the surface are brought up in the device being prepared by this workman. Welcomed are the sample cores showing oil traces.

Often finely ground heavy minerals, such as hematite and barite, are added to the mud to give it the added density needed to hold back gas, which exists under terrific pressure, and thus prevent "blowouts" during drilling. The circulating mud is made to perform such delicate jobs as rebuilding walls when wells begin to cave in, or by addition of chemicals to cause the clay in the mud to cling to the walls and seal off porous rock which might contain water. The trick in use of mud to lubricate the drill pipe and bit lies in a valve located near the bottom of the drill pipe. Mud flows under pressure out through the valve, but cannot back up into the drill pipe. Therefore, the two-mile-long pipe tends to rest on a pillar of liquid rock at the bottom of the hole. Were it not for the muddy cushion, the drill pipe would stretch a full hundred feet.

The bit is not merely dropped into the hole and turned, bearing on its point the entire weight of the drill pipe. Most deep wells are started at the surface with a bit measuring 27 inches in diameter, but by the time they reach the 10,000-foot level, bits measuring no more than 4¼ inches are doing the job. Since a string of 4½-inch pipe nearly two miles long weighs 83 tons, it would buckle under its own

[*Continued on page* 152]


BUMPER HOUSING
CAP
BY PASS
RUBBER SAFETY BUMPER
OIL TRAP TO STOP PLUNGER AND OPEN VALVE
UPPER STACK NIPPLE
DISCHARGE
PLUNGER TRAP VALVE
GAS INLET
SUSPENSION NIPPLE
OIL FLOWS THROUGH HERE
DISCHARGE NOZZLE
GAS GOES THROUGH OUTER SPACE
SPECIAL SMOOTH-BORE TUBING
PLUNGER FALLING BY GRAVITY
OUTER CASING
VALVE OPEN
PLUNGER STRIKES CUSHION SEAT, CLOSING VALVE
OIL FORCED UPWARD BY GAS PRESSURE THROUGH PERFORATED BULL PLUG

Oil operates its own elevator by means of Hughes ingenious device. Inside the oil well casing is lowered a special smooth-bore tubing which furnishes the shaft for a special plunger. The plunger, falling by gravity passes through a column of oil standing in the bottom of the tube, a valve closes, and gas pressure blows plunger and oil to the surface trap.

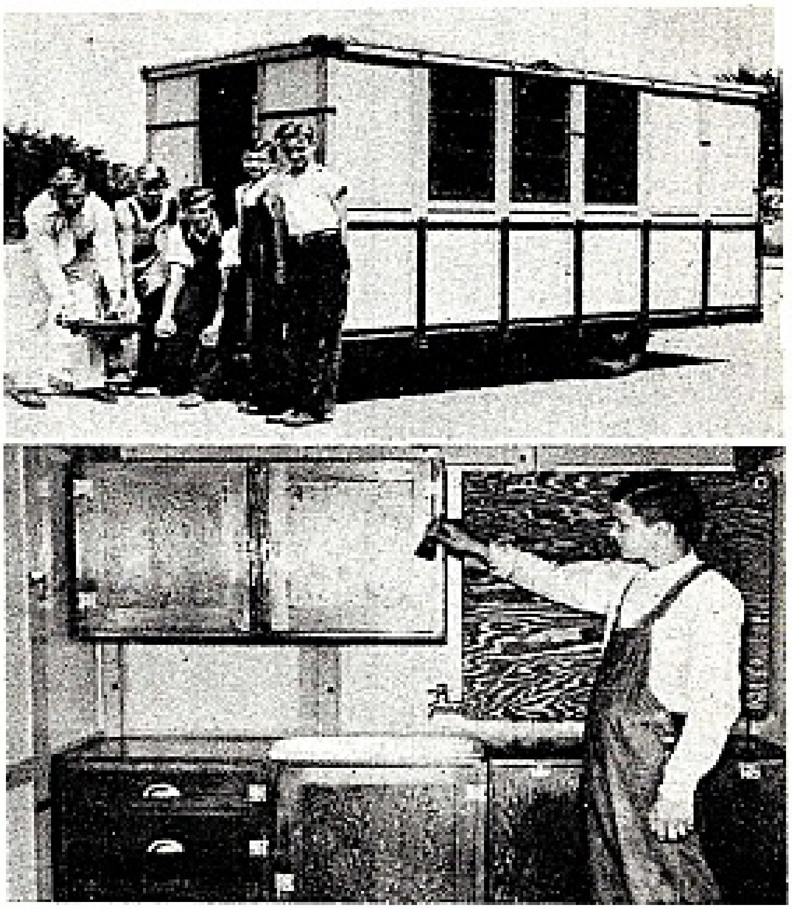
World's 13 Deepest Wells

Name	Location	Depth In Feet
Jarnigan No. 1	Roanoke, La.	10,001
Martinez No. 1	Arcadia Parish, La.	10.002
Hobson No. 2-A	Ventura County, Calif.	10030
Halff & Oppenheimer No. 2	Pearsall, Tex.	10,050
Culp No. 6	Cement, Okla.	10,079
56-8-Q	Kettleman Hills, Calif	10,154
Bradley No. 1	Santa Barbara County, Calif.	10,296
Jardine No. 35	Vera Cruz, Mexico	10,585
Lillis & Welch No. 1	Kettleman Hills, Calif	10,994
Chitorani No. 1	Roumania	11,167
A-Dah-Noe No. 1	Caddo County, Okla.	11,230
Berry No. 1	Kern County, Calif.	11,377
McElroy No. 103	Crane County, Tex.	12,786

Grade School Pupils Build Furnished Camping Trailer

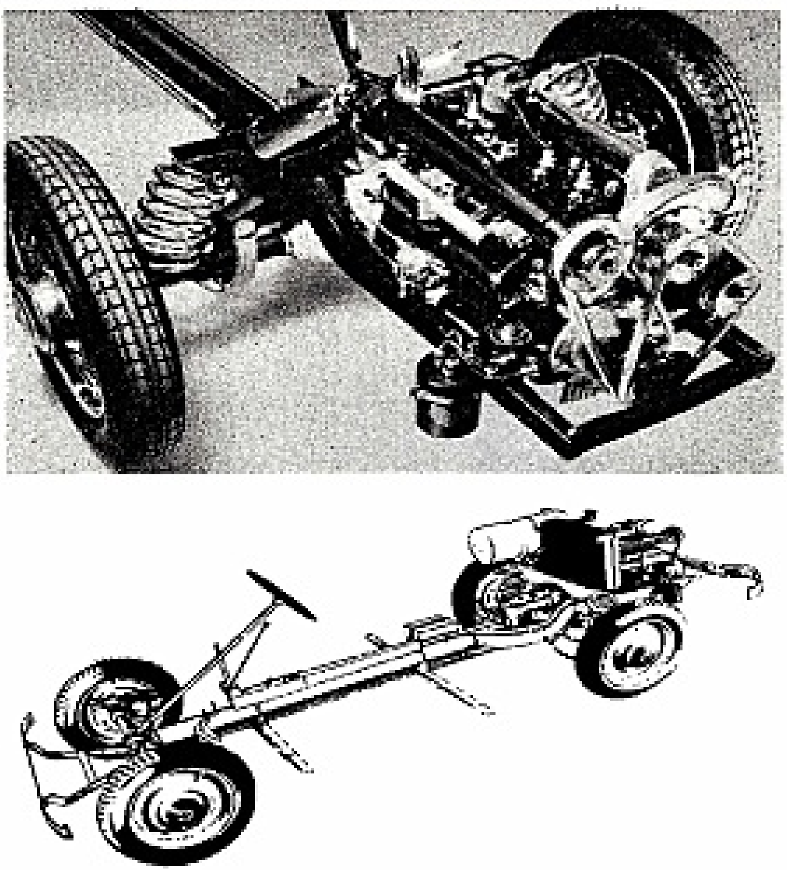
IT TOOK a whole year to do it, including one full month of vacation time, but the youngsters in the advanced manual training class at the Bremer school, Minneapolis, successfully built an elaborately equipped camping trailer, 6 feet wide by 12 feet long.

The trailer is built in sections, and can be easily folded into a small space. When removed from its chassis and assembled on the ground, the trailer forms a house 10 feet wide by 14 feet long. Inside there are four bunks, a six-place dining room, and an up-to-the-minute kitchen complete with running water.



These youngsters of the Bremer school, Minneapolis, built this trailer as part of their manual training project. The lower photo shows the thoroughness with which they finished the interior. The trailer folds up tightly when not in use.

Single Tube Forms Car Chassis



Above—The single tube chassis forms a Y at the rear to support the rear mounted motor. The illustration below shows the manner in which the front wheels are fastened to frame.

A SINGLE hollow steel tube furnishes the unique chassis for the latest model car to come from the oldest automobile factory in the world, the Daimler Benz plant of Germany. The tube chassis is forked at the rear to form the engine support for the rear mounted motor.

Two light but very strong cross arms are welded to the tube to support the body frame. Because of its unusual design, the chassis costs less to build and assemble.

Squad Car Is "Voice of Safety"

THE "Voice of Safety" has taken to wheels, and now throughout Jersey City, at any time of the day violators of traffic rules are apt to hear a safety lecture forcibly dinned into their ears from a police car loud speaker.

The "voice" can be either that of the driver of the car, or by means of a two-way radio, that of a police official at headquarters. In addition to warning drivers and pedestrians, the car delivers safety talks.

POLICE
J.C.
DEPT.

Street corner safety lectures are brought to the citizens of Jersey City by this loudspeaker-equipped police car. The informal talks have been found effective in reducing accidents.

SPORTSMEN'S

TALK YOUR DUCKS

by OSCAR QUAM

Founder of a Noted Minnesota School of Duck Hunting

SPORT such as most hunters have never experienced awaits the sportsman who attempts to "talk his ducks into the bag."

Ducks are notorious talkers. A hunter can hear them gabbling among the wild rice patches as he cautiously creeps through the marsh to get within range. Or else he hears them quack derisively as they circle high over his blind. Most important of all, he hears one flock in the water telling another flock overhead, the "water is fine—come on in."

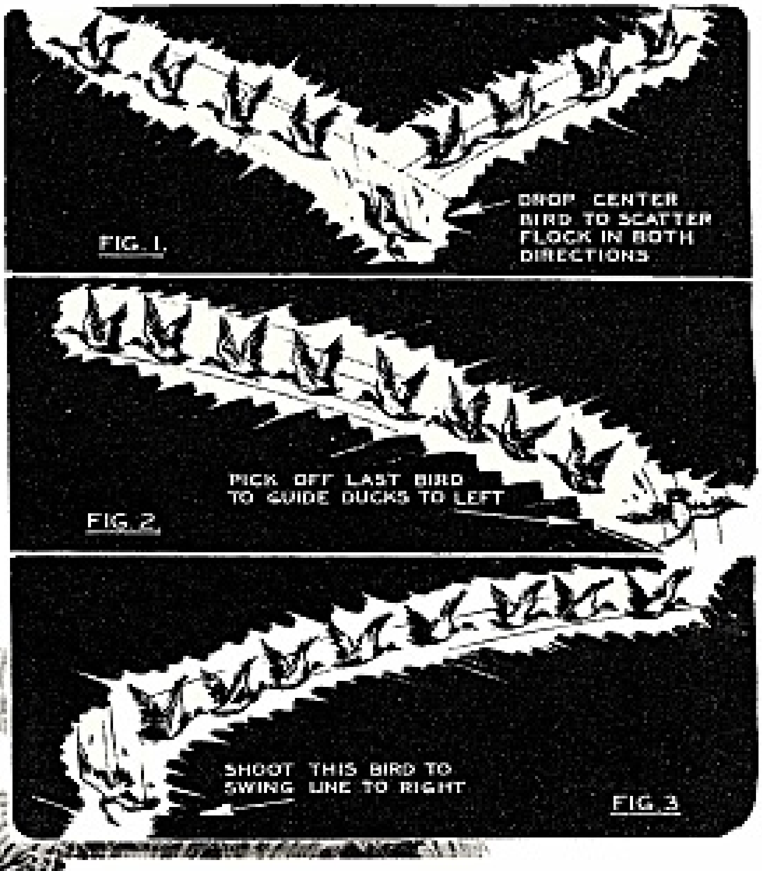
When the hunter hears that kind of talk, he sinks just a little lower in his blind, his eyes get brighter, and his muscles grow just a bit more tense as he waits for the flock above to circle lower for a landing. In his heart he wishes fervently he could talk the duck language himself.

Surprisingly enough, the task is easy, requiring only some practice, and the thrill of coming in with ducks literally talked into the bag more than compensates for the time spent in learning the lingo.

Many hunters who have heard of the thrills to be found in duck calling resolve to attempt it without first learning the tonal qualities most desired in an artificial call. They buy a low pitched call with much the same quality as that of a drake because the sound appeals to them. That is a mistake, as the drake does very little talking. During migration it is the female's high pitched voice that announces the discovery of a new feeding grounds, or welcomes new arrivals from the sky.

On a good duck call, the operator should be able to play the full scale, saying quack to

The end of a perfect day finds this hunter returning to his camp in Dorchester Co., Md., with a prized collection of canvas backs and two great Canadian honkers.


DROP CENTER BIRD TO SCATTER FLOCK IN BOTH DIRECTIONS
FIG. 1.
PICK OFF LAST BIRD TO GUIDE DUCKS TO LEFT
FIG. 2.
SHOOT THIS BIRD TO SWING LINE TO RIGHT
FIG. 3

Ducks almost invariably fly away from a falling bird. When ducks, lured by your call, head towards you in customary straight line formation, you can divide the flock by dropping center bird. To turn the flock to the left, drop the right end bird, and *vice versa*.

Into the BAG

The art of calling ducks is one that has been long neglected by the majority of hunters. Yet to those who "know the lingo," duck calling provides a thrill that can be experienced in no other way. This article tells how, why, when and where.

Oscar Quam, the author of this article, crouches behind the blind and quacks out the greeting call, shown on the scale at left. This call welcomes an incoming flock. If they ignore the welcome, the come-back call is used.

each note. Duck calls that do not have the full scale range are not effective enough for all around use. I prefer one with the barrel and stopper made of wood seasoned in linseed oil. Wood dulls the artificial tone of the call. The reed should be made of bronze as that is least affected by weather, and lasts a lifetime. To learn tone control, the beginner should practice the scale until he can get the "quack" inflection into each note perfectly.

After the scale has been mastered, the next step is to learn the mallard language. Mallard talk is the Esperanto of the dipper class of ducks which includes pin tails, widgeons, gadwalls, spoonbills and teal. The calls might be divided roughly into the feeding call, the come-back call, the greeting, the sociable pass-the-time-of-day call and the lonesome call. Of them all, the come-back call is the most valuable to know.

The call of the lazy hen, given mostly in the middle of the day, has only four notes drawn out in a tired manner. The lonesome hen call is very effective, consisting of

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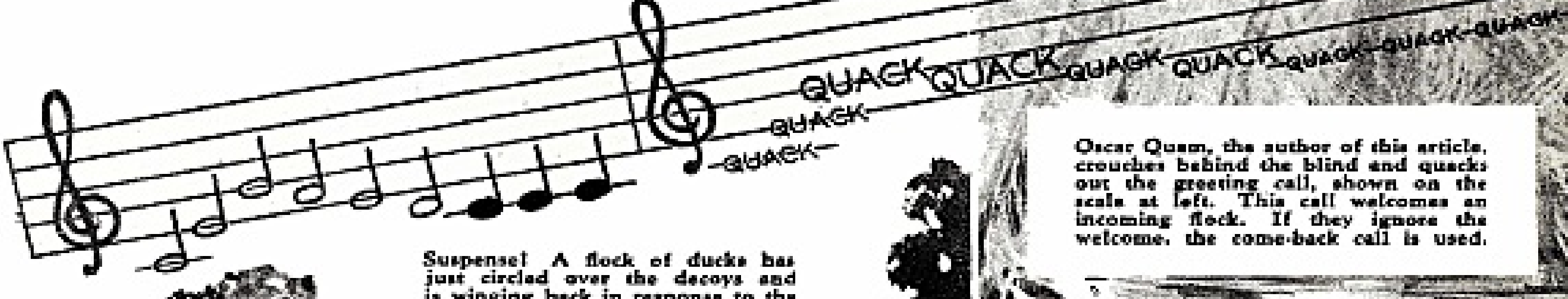
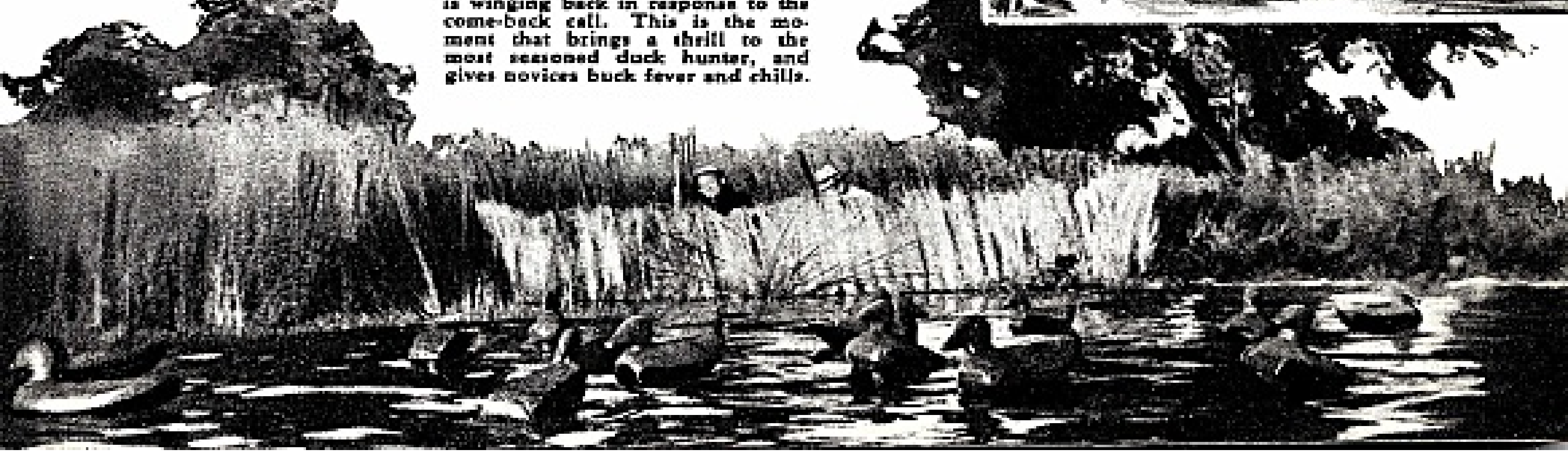


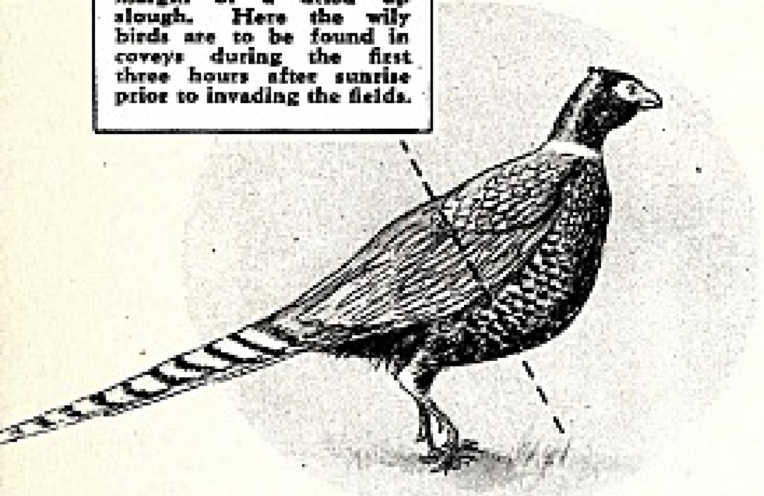


Suspense! A flock of ducks has just circled over the decoys and is winging back in response to the come-back call. This is the moment that brings a thrill to the most seasoned duck hunter, and gives novices buck fever and chills.

SPORTSMEN'S MATCHING WITS

The ring neck pheasant matches a native cunning with the hunter's skill, and more often than not the hunter is second best. In this article, some of the wily bird's tricks are revealed for the first time.

Dawn of the opening day of the pheasant season finds this hunter silhouetted against the rocky margin of a dried up slough. Here the wily birds are to be found in coveys during the first three hours after sunrise prior to invading the fields.



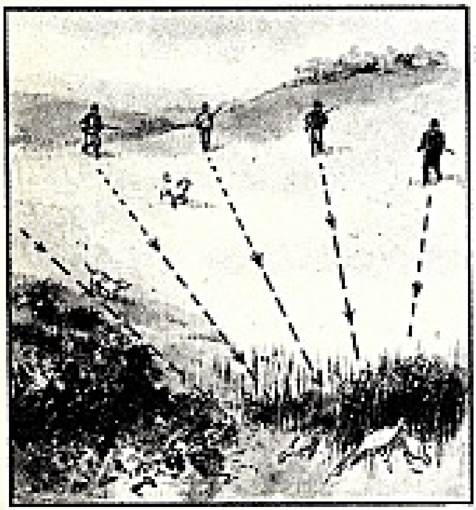
In spite of the pheasant's size, accurate shooting is necessary, as the vital organs are placed well forward. Any side shot to the rear of the line shown draws big burst of feathers, but the bird usually escapes.

HUNTING the pheasant, America's most popular upland gamebird, cannot be reduced to a formula.

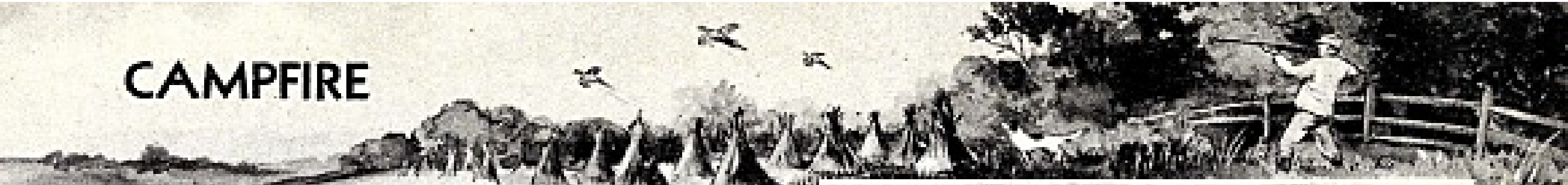
Formerly only a sport for kings—whose beaters would drive the birds past comfortable shooting boxes on large estates—the rise of the pheasant as an American game-bird has been almost wholly within the last decade. About twenty years ago American sportsmen, noting their hardy nature and the rapidity with which they reproduced, introduced them into this country to augment our dwindling supply of native birds.

During this time, they have propagated and spread in a wide band from lower California up through the middle-west and out to the east coast to assume the position of America's most universally hunted upland game bird. They have produced a new era in shooting, providing the green, inexperienced hunter with a large, slow-moving target; at the same time thrilling seasoned hunters after the first day's hunt by refusing to flush unless forced to do so.

Seven of ten hunters spend most of their time in cornfields, knowing that they are the usual habitat of the feeding pheasant.



Above—The "basket" drive, the hunters arranged in a semi-circle, gradually closing in on their quarry as the field narrows down. Right—As the dog brings in the results of the last drive, the hunters meet to discuss a likely spot for next foray.



with the WILY PHEASANT

by
MARVIN P. SPITTLER

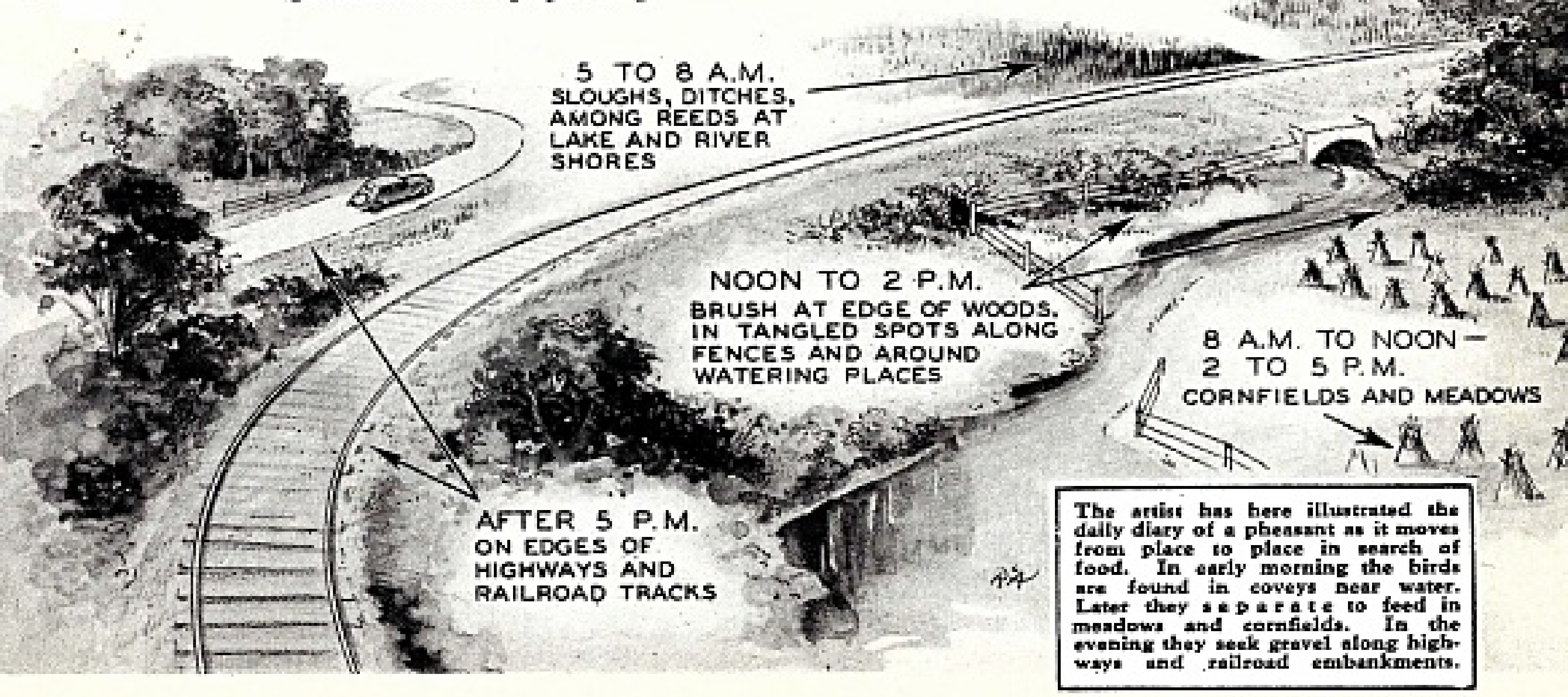
Those same seven hunters, granted that they start at dawn and stop at sunset, are wasting the hours between five a.m. and eight a.m., between noon and two p.m.—for they are hunting in cornfields where only a few hungry stragglers are feeding. For the pheasant, like the human, is a creature of most regular and precise habits when not driven too severely.

Morning usually finds him at home in dried-up sloughs, brambly ditches, or amongst the reeds around lake-shores and river-beds. Here, at the break of dawn is the hunter's best chance of the day to shoot his limit in a hurry, for rather than being scattered and feeding in the cornfields, they are concentrated in pairs and coveys, their acuteness somewhat dulled by the soundness of a night's sleep and the security of companionship. Whereas it is almost impossible to flush them here an hour after sunrise, they are often startled into a befuddled rise before that time.

The usual route of the pheasant in the morning leads to a place where he can get

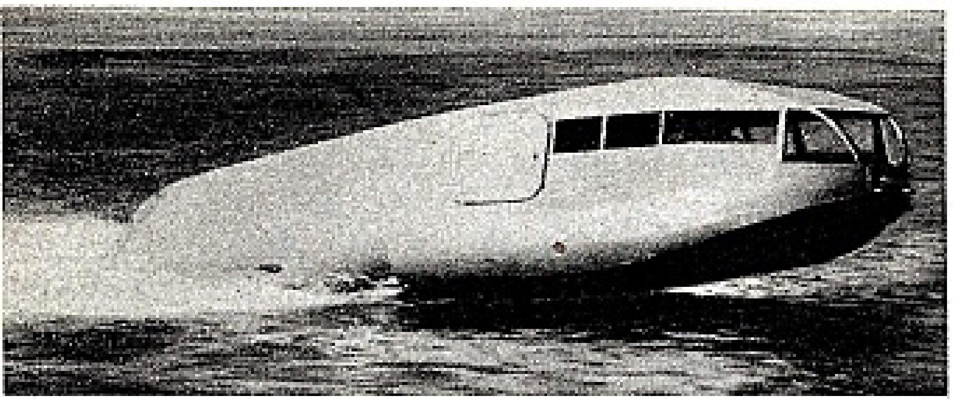
[*Continued on page* 122]

Success! This New Jersey sportsman pauses to inspect a fine cock pheasant his dog has just retrieved from the slough bottom. The dog approves.


5 TO 8 A.M.
SLOUGHS, DITCHES, AMONG REEDS AT LAKE AND RIVER SHORES
NOON TO 2 P.M.
BRUSH AT EDGE OF WOODS, IN TANGLED SPOTS ALONG FENCES AND AROUND WATERING PLACES
8 A.M. TO NOON— 2 TO 5 P.M.
CORNFIELDS AND MEADOWS
AFTER 5 P.M.
ON EDGES OF HIGHWAYS AND RAILROAD TRACKS

The artist has here illustrated the daily diary of a pheasant as it moves from place to place in search of food. In early morning the birds are found in coveys near water. Later they separate to feed in meadows and cornfields. In the evening they seek gravel along highways and railroad embankments.

Speedboat Forecasts New Designs



This whale-like craft, the Native Son, is the latest thing in fully streamlined speed boats. It was designed by D. R. Crawford and N. K. Patton of Pasadena, Calif. Tests prove it exceptionally easy to handle.

A FULLY streamlined speedboat, the *Native Son*, has successfully passed a series of severe speed trials this summer and is now prepared to enter a number of races. While built on a 14-foot hull, the whale-like craft measures 16 feet overall, with a 6½ foot beam and a height of 4½ feet.

The *Native Son* is powered with a Ford B motor operating through a V-drive. The hull is built entirely of plywood, and though the bottom is of different design than the conventional motorboat, it does include the customary hydroplane step. Because of lowered resistance, the craft has high speed.

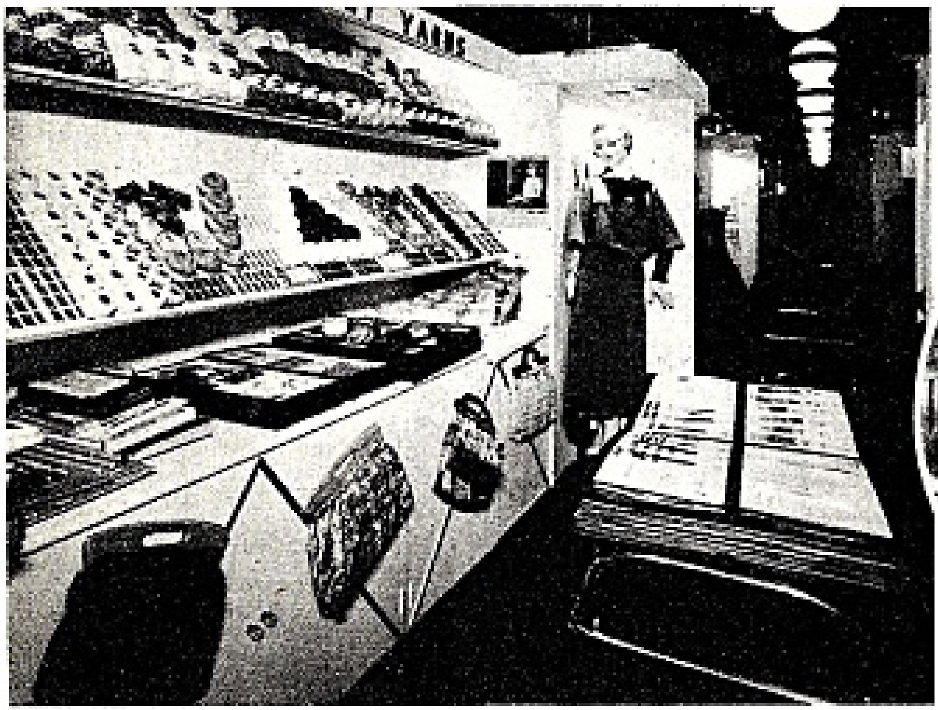
10-Car Train "Peddles" Merchandise

THE Twentieth Century counterpart of the itinerant pack peddler of pioneer days is exemplified in the special 10-car, air-conditioned train with which Marshall Field and Company, Chicago, are bringing their merchandise to the retailers of the midwest.

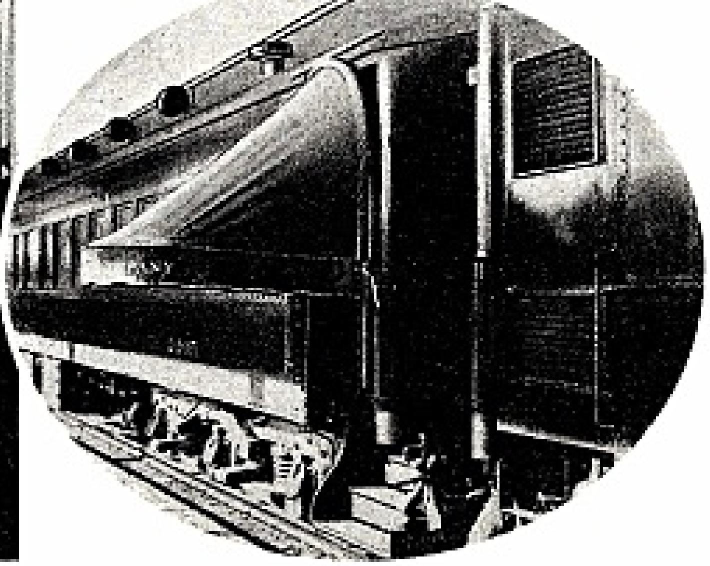
Every department of a great store is represented in the "show-case on wheels." The interior of the coaches have been equipped with the latest in lighting effects to display merchandise to its best advantage. In addition to carrying a sales force of 25 men and women who explain the features of the merchandise to the retailers, there is a force of advertising experts, artists and window dressers who aid the local merchant in his advertising problems.

Criminals Can't "Erase" Eye-Prints

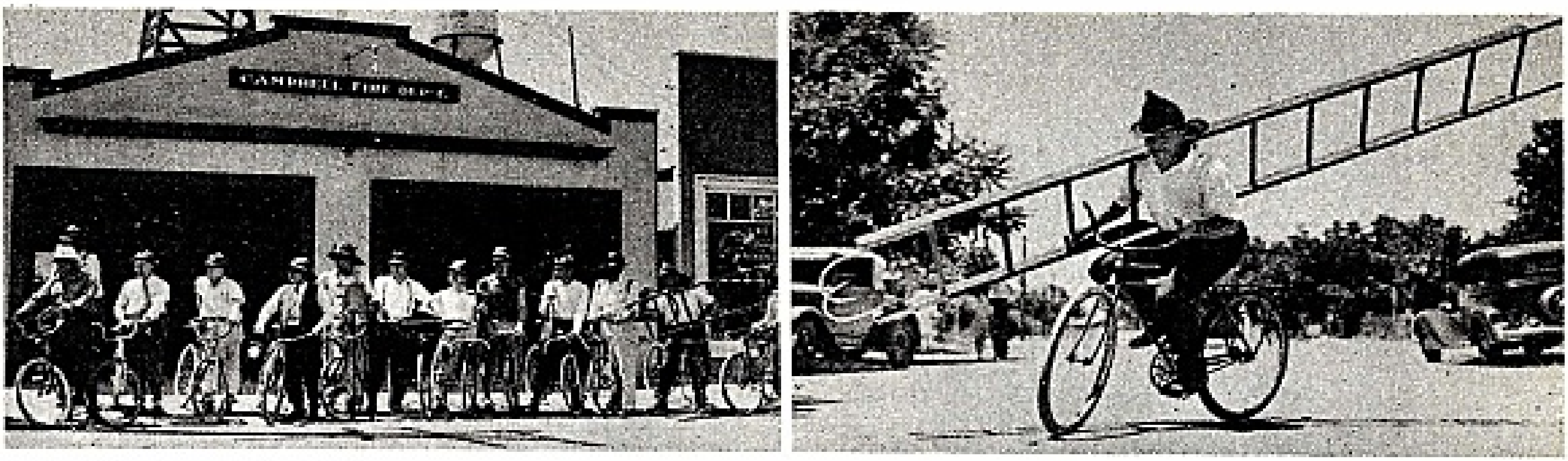
THE attempts of desperate criminals to avoid identification by effacing their finger prints has lead to the discovery of an identification system which not even the toughest gangster will attempt to outwit. The system, described at a police convention recently, consists of photographs of the eyes, no two eyes ever having the same pattern of blood vessels and nerves in the background. Criminals will have their faces lifted, or endure torture to have their finger prints partially destroyed, but they will not destroy their eyes.



Left—An interior view of the dry goods department of Marshall Field and Company's "show room on wheels." Below—The depot entrance.



California Smoke Eaters Pedal Fire Engines to Flames


CAMPBELL FIRE DEPT.

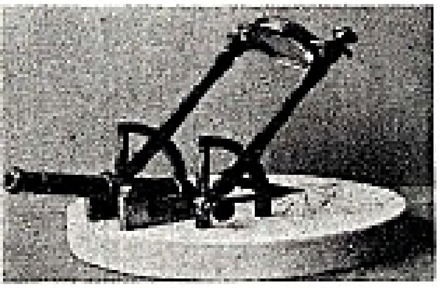
Left—The Campbell, California, fire department lines up for inspection, each man with his apparatus and bicycle. Notice the streamlined bicycles, with racing handle bars and everything. Above—The one-man hook and ladder truck goes out for a trial spin. Carrying a long ladder while racing to a fire on a bicycle is a job that needs lots of practice and natural agility.

FIRES in Campbell, California, just haven't got a chance anymore, now that the town has purchased 12 new units of fire fighting apparatus. When the city fathers decided that motor equipment was too expensive, the fire department rose to the occasion and bought 12 new machines, all bicycles.

To insure prompt attendance at all fires, the bicycles have streamlined, racer handle bars. Mud guards are eliminated for additional streamlining. Every member of the force is assigned to a certain piece of fire fighting equipment, and all pieces, such as ladders and hose sections, have been reduced in size so that they can be readily transported.

In operation only a few weeks, the new apparatus has already proven its economy and effectiveness. Other small towns unable to afford motorized equipment, are now eyeing the bicycle brigade favorably.

Sun Dial Cannon Shoots At Noon



At high noon the rays of the sun strike through the glass lens upon the flash pan, firing the cannon.

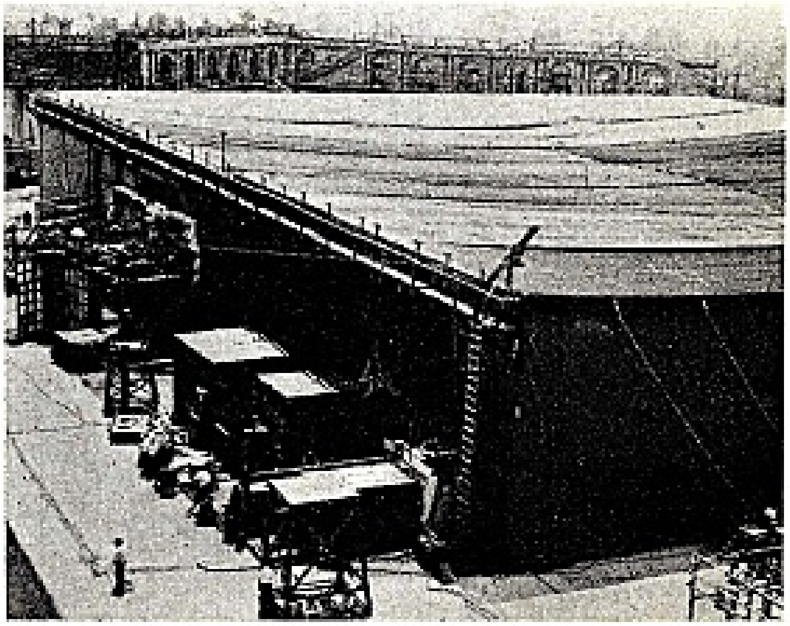
A MINIATURE cannon, combined with a burning glass, has been mounted on a sun dial by a Cuban inventor so that at high noon the rays from the glass ignite the cannon charge and shoot the hour. Shooting the hour is an old Cuban custom, practiced for generations, though now heard only at 9 p. m., the curfew hour.

Ten Tons of Ice Cool Movie Set

WHEN the heat of the 150 sun-arc lamps plus the summer sun raised to 140 degrees the temperature inside a huge, canvas covered set built for the filming of "Barbary Coast," Hollywood producers used 10 tons of ice daily to air condition the interior.

The canvas set, covering 2 acres, is one of the largest built in recent years. To reduce the heat for the actors and actresses working before the lamps, 5 tons of the ice were used to cool the water with which the air was washed, and an additional 5 tons were placed about the set while huge fans blew the air between the ice cakes.

The cold air also is needed for the manufacture of fog for some scenes.



Ten tons of ice daily are needed to cool this 2 acre, canvas covered movie set. It contains a full sized sailing schooner in a tank, and a whole street of old style houses.

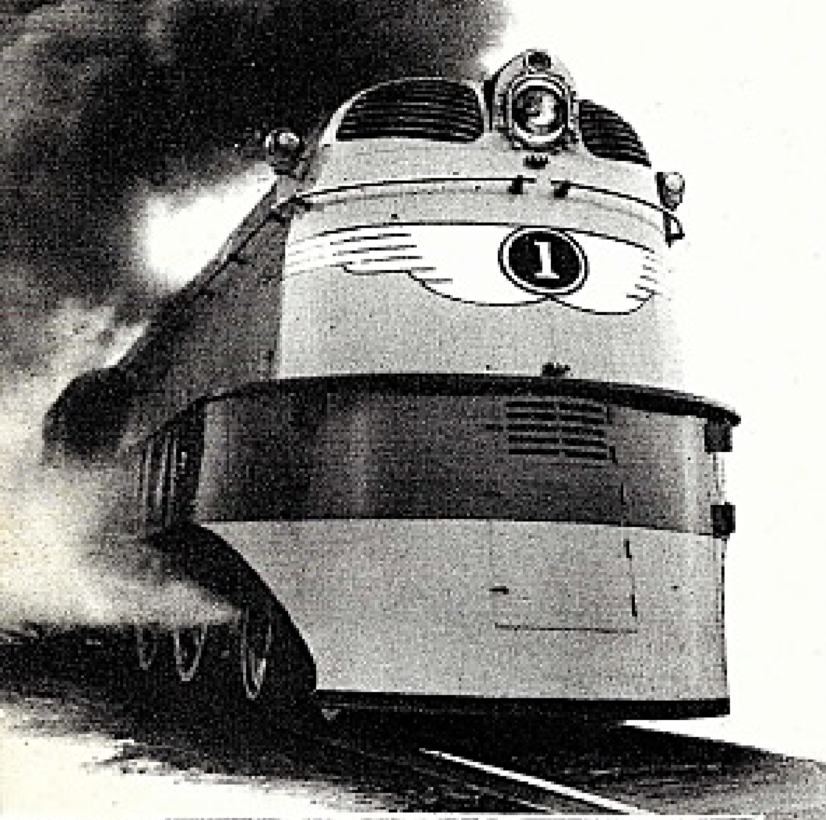
Streamline BEAUTIES

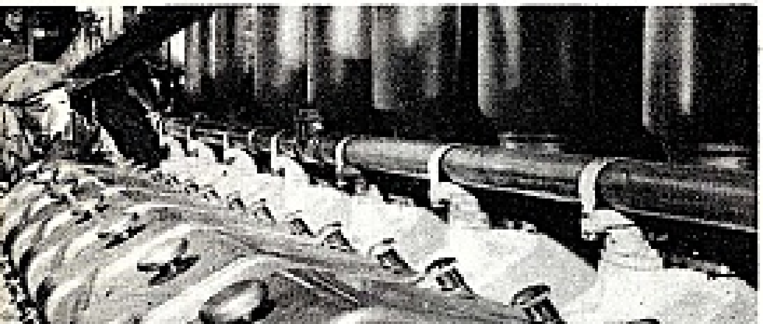
ROLLING along railways of the world at greater than mile-a-minute speeds, streamlined trains are conquering time and space in an attempt to keep the traveling public from deserting the rails for airplanes and motor buses.

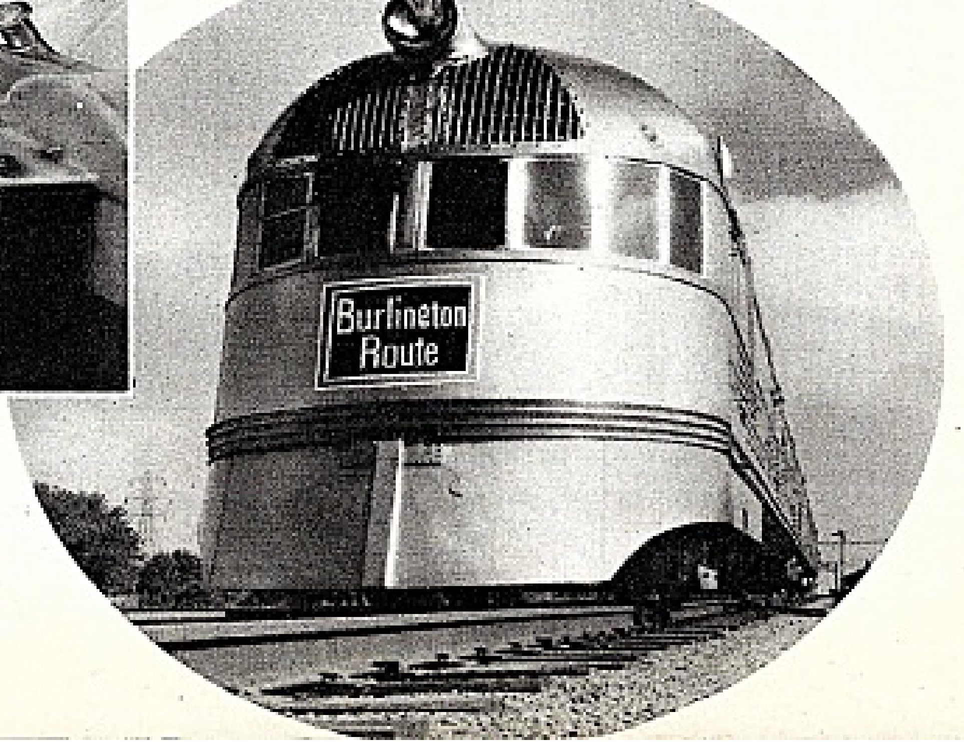
Three choices have been offered to the jury of travelers—the ordinary steam train running on faster schedules, the beautiful Diesel-powered streamliner, and the light weight steam streamliner in its gleaming new dress of chromium and brass. A fourth contestant recently entered the picture—a turbine-drive steam locomotive that may surpass all others in speed, safety, and comfort.

Making its first trials on British railways is the turbomotive, popularly called the "hush hush" giant because of the secrecy which cloaked development work on the engine. No exterior working parts, two funnels, a radiator, and a high efficiency steam turbine drive make this train a radical departure from ever-conservative British design.

In answer to the challenge, "Are steam locomotives doomed?" S. A. Kraft, a St. Paul, Minn., mechanical engineer, designed the super-turbine train pictured on the cover of this issue. With drive wheels nearly as high as the train itself carrying the entire weight of the engine, there is no weight resting on wheels that produce no power. Independent







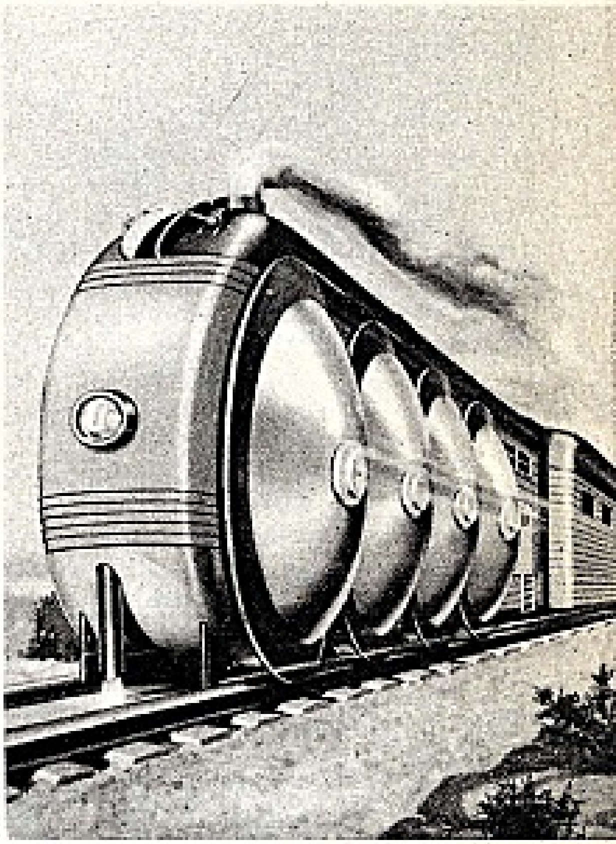
Two beauties challenge the Iron Horse for supremacy on the Chicago-Twin Cities route. Over this speedway of America race each day the streamlined oil-burning steam train *Hiawatha* (top), the twin *Zephyr* Diesels, one of which is shown at the right, and *The 400*, conventional, but improved, steam locomotive. Time schedules are about the same for each. The V-16 Diesel engine (above) develops 1,200 horsepower for the Union Pacific's *City of Portland*.

Lure TRAVELERS to Rails

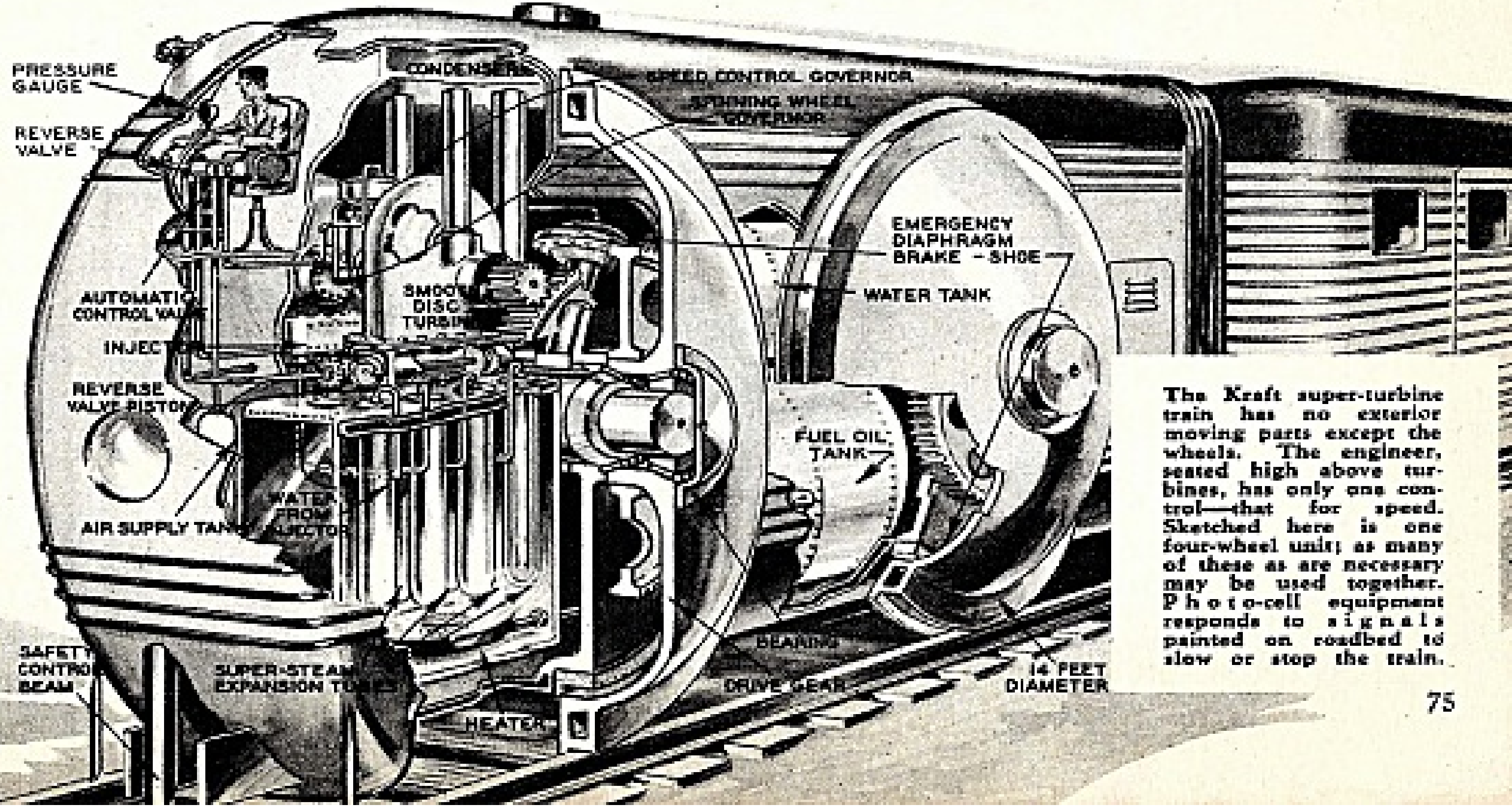
drive for each wheel eliminates any drag in rounding curves.

Geared to each of the wheels is a steam turbine having a perfectly smooth disc. Super-steam directed against this disc at terrific pressure exerts as much force as it would against vanes.

The roadbed itself is the only limit to the speed of this million-pound rail giant. Control is completely automatic, the engineer having only to set the single throttle to the desired speed. By a system of compressed air lines, valves are opened to admit steam to each turbine until the train reaches running speed, and brakes are



Shortly after British railways carried out first tests on the *turbomotive,* turbine-driven steam locomotive shown at left, S. A. Kraft, St. Paul, Minn., mechanical engineer, announced his design of the above super-turbine speed train.


PRESSURE GAUGE
REVERSE VALVE
CONDENSERS
SPEED CONTROL GOVERNOR
SPINNING WHEEL GOVERNOR
AUTOMATIC CONTROL VA
SMOO DISC TURBI
INJECT
REVERSE VALVE PISTON
WATER FROM INJECTOR
AIR SUPPLY TAN
EMERGENCY DIAPHRAGM BRAKE - SHOE
WATER TANK
FUEL OIL TANK
BEARING
SAFETY CONTRO BEAM
SUPER-STEAM EXPANSION TU
HEATER
DRIVE GEAR
14 FEET DIAMETER

The Kraft super-turbine train has no exterior moving parts except the wheels. The engineer, seated high above turbines, has only one control—that for speed. Sketched here is one four-wheel unit; as many of these as are necessary may be used together. Photo-cell equipment responds to signals painted on roadbed to slow or stop the train.

STREAMLINERS CHALLENGE THE "IRON HORSE"

applied automatically whenever this speed is exceeded on down grades. Should any wheel slip while maximum tractive effort is being applied in starting, steam will be cut off from that turbine momentarily to give the wheel a chance to grip the rails again.

No air brake lever would be needed, for the robot control system applies brakes just as soon as the train is travelling two miles faster than the speed at which the throttle is set.

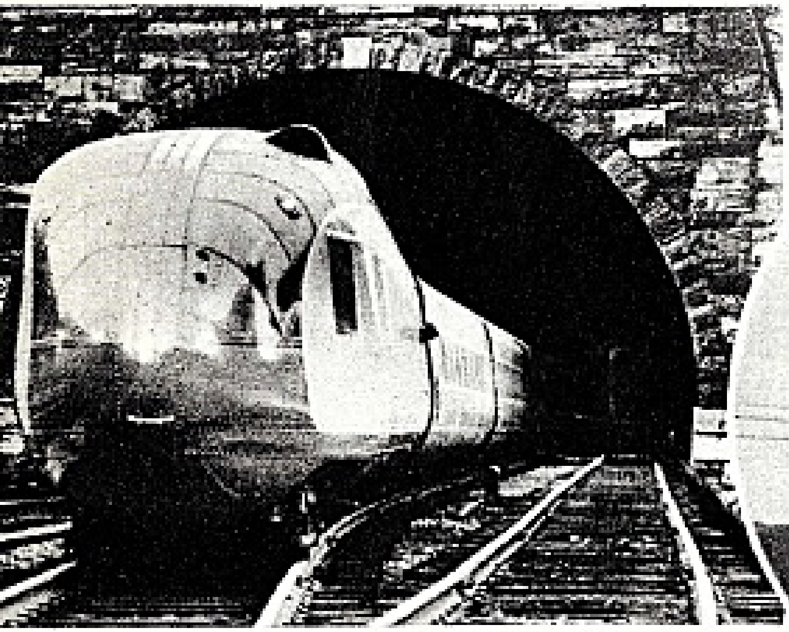
Best known of the new steam trains is *The 400*, for a time the fastest scheduled train in the country. Increased boiler pressure, larger drive wheels, use of oil fuel to eliminate coaling stops, and heavily-ballasted roadbeds made the greater speed possible.

In a merry-go-round of speed, Burlington's twin *Zephyrs*, popular Diesel-powered trains, are each making a round trip a day on the speedway of America, the route between the Twin Cities and Chicago.

But a scant year ago the first Union Pacific streamliner started the back-to-the-rails campaign. Rebuilt into a 7-car unit with a new 1,200 h.p. Winton Diesel power plant, this original *M-10001* has been rechristened *City of Portland*. Running on a 40-hour schedule between Chicago and Portland, it brings Chicagoans 12 hours closer to the West coast by rail.

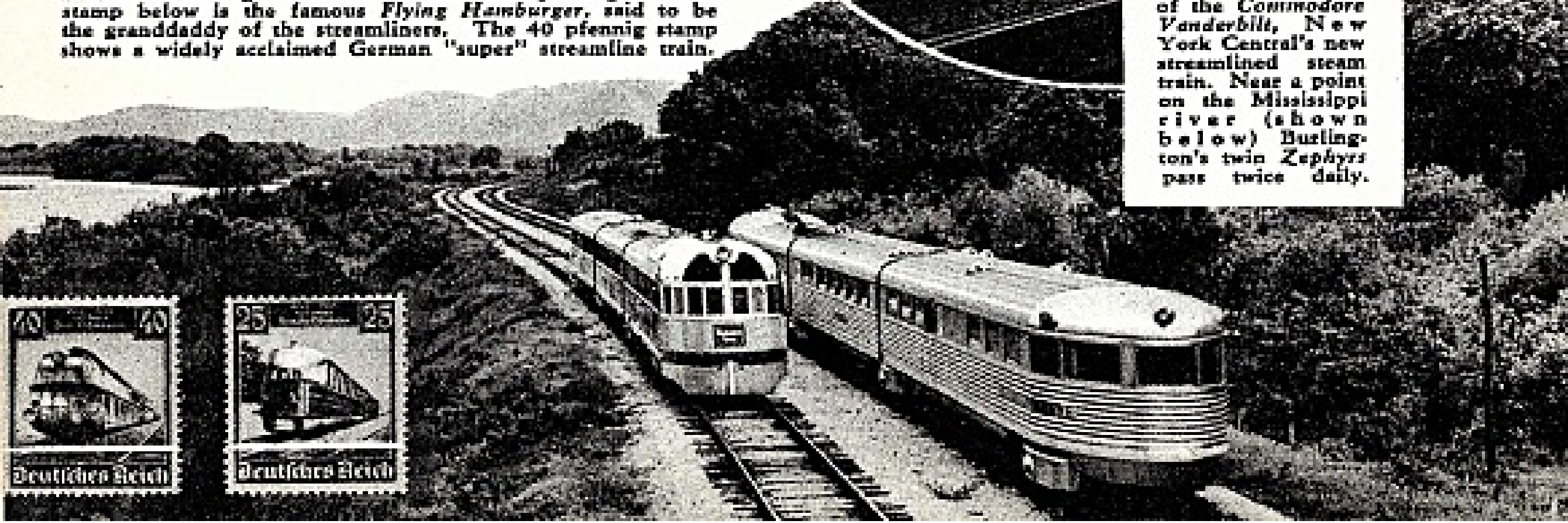
North, East, South, or West—Diesel streamliners are whizzing over the rails.

Streamlined steam power is the answer of several roads to Diesel competition. The Milwaukee Road's *Hiawatha*, designed for two-mile a minute speed, races the *Zephyrs* and *The 400* daily on the Chicago-Twin Cities route. Other lightweight steam trains are the *Twentieth Century* and *Broadway Limited* in the United States, the *Flying Hamburger* and *Flying Frankfurter* in Germany, the *Asia*, in Southern Manchuria, and scores of other challengers in nearly every nation of the world.



This is not a prehistoric caterpillar crawling out of its cave, but the tail-end of the new Union Pacific streamliner *City of Portland* entering a tunnel. On the 25 pfennig German stamp below is the famous *Flying Hamburger*, said to be the granddaddy of the streamliners. The 40 pfennig stamp shows a widely acclaimed German "super" streamline train.

Smoke and steam emphasize the streamline beauty of the *Commodore Vanderbilt*, New York Central's new streamlined steam train. Near a point on the Mississippi river (shown below) Burlington's twin *Zephyrs* pass twice daily.

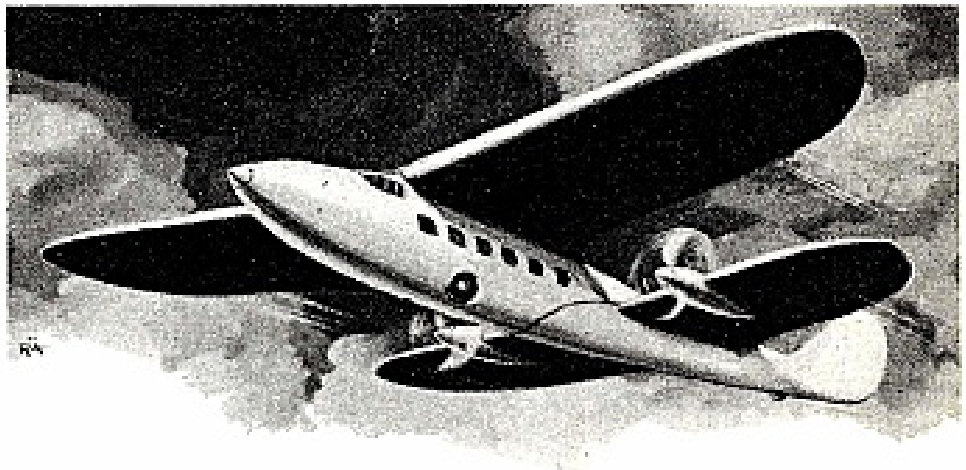


French Midget Planes Provide Design for Giant Sky Liner

THE remarkable airworthiness of those midget airplanes, the "Flying Lice," which have taken France by storm and are now invading England, has led designers of air liners to see if the plans cannot be adopted to their use.

Present developments call for a plane with no ailerons, elevator, or rudder bar, but which has automatic stability in all flying conditions. This is found in the plans of Henri Mignet, French aeronautical engineer.

According to his plans, the wings of the plane will be mounted in tandem, a reversion of early day flying experiments. Should the plane stall, a simple forward movement of the control lever tilts the main front wing, slipping the plane into a long glide. The twin motors are located in the rear wings. Among the advantages claimed for the new plane is that it will be able to take off or land in a comparatively small field.



This is the artist's conception of the new type of passenger plane, called the "Flying Bug," designed by Henri Mignet, of France. The wings are mounted in tandem and have no ailerons. The main wings are tiltable.

Outboard Powers Cruising Mattress

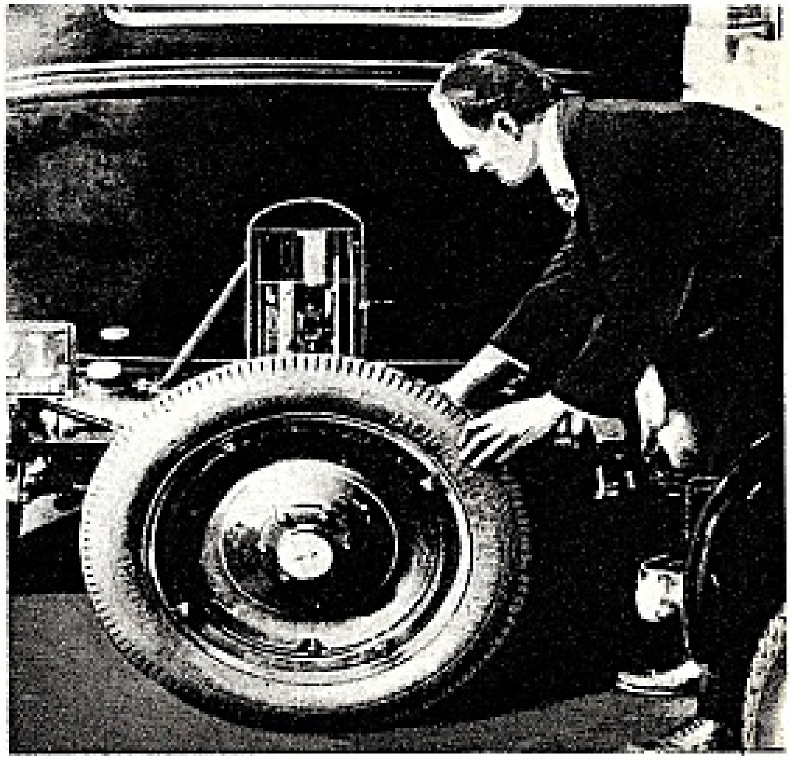
These cruising mattresses were one of the features of the New England Mardi Gras, held at Lake Maranacook recently. Keeping one on its course was not easy, but lots of fun.

THE adaptability of outboard motors to propel anything in the low weight class that floats was demonstrated at the New England Mardi Gras of outdoor sports, held at Lake Maranacook, Maine, recently. One of the features of the 10-day carnival was an outboard mattress derby.

The cruising mattresses were equipped with wood frames to support the motor and prevent the bedding from doubling over.

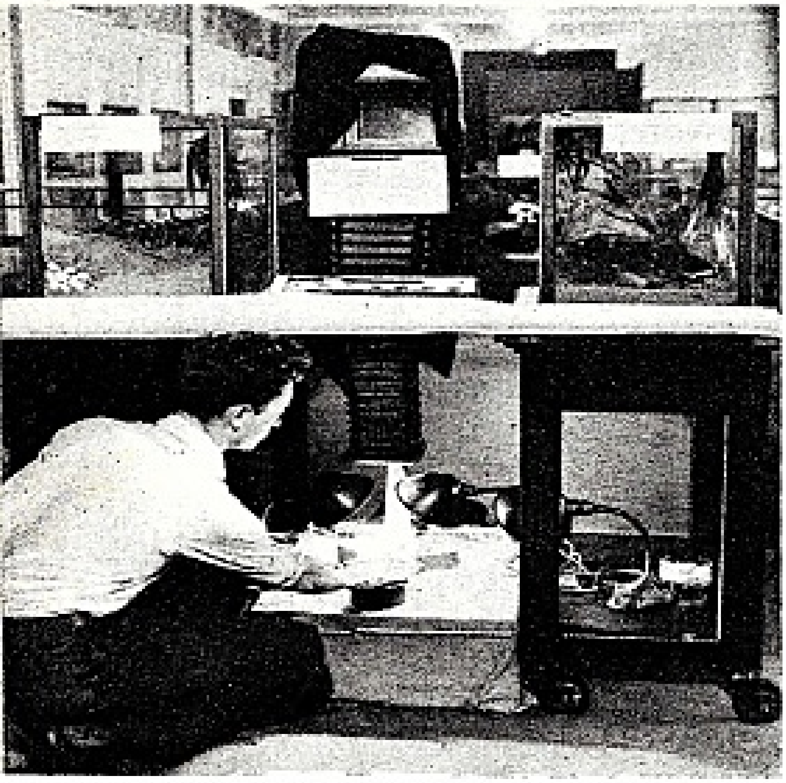
Spare Tire Becomes Fifth Wheel

AT LAST an inventor has come forth to put the spare tire on the back of his car to work. He is Arthur E. Beauchamp, East Jaffrey, N. H., and his invention not only serves as a fifth wheel for parking his car, but can also be used as a hydraulic jack to raise the rear end. It operates on a vertical slide under hydraulic pressure, and after raising the rear end, can swing the car left and right with power supplied by the car motor.



Arthur Beauchamp demonstrates how his fifth wheel can be lowered and used for parking the car. All mechanism is powered by the car motor, and controlled from the driver's seat.

Screen Reveals Secrets of Life as It Forms Within Shell



On the screen at the top of this device is revealed all that goes on inside the hatching egg being adjusted on the box below. Turtle eggs, such as those in upper left, are used.

THE miracle of life as it occurs within an egg has at last been revealed to the public by means of a machine invented by Dr. G. Kingsley Noble and Dr. H. J. Clausen of the American Museum of Natural History, New York.

By means of a series of mirrors arranged within a camera-like bellows, strong rays are focused upon the egg, the enlarged image of which is then reflected upon a screen at the top. At present, turtle eggs are used, as the soft, semi-transparent shell is best suited for the purpose.

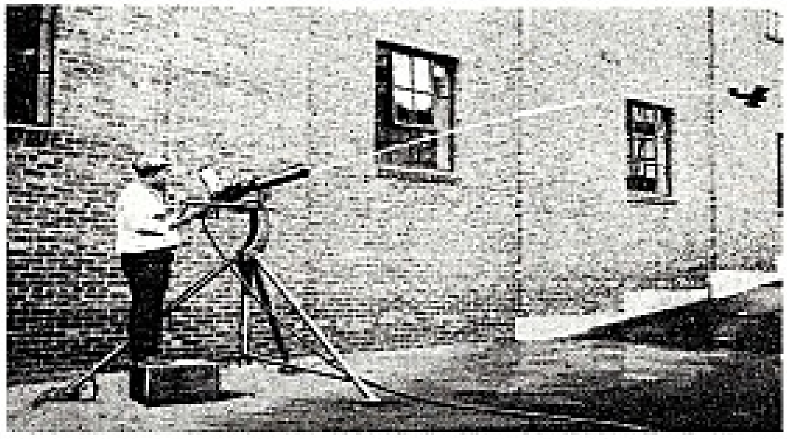
Past efforts to learn what goes on inside of a hatching egg have proven unsatisfactory in that only a limited portion of the interior of the egg could be made visible. With this device, all activity is clearly shown.

Onions Lose Odor: No Tears Shed

TEARLESS and odorless is the new onion about to be presented to long suffering housewives the world over. No longer will the eyes become red and the breath pungent when that vegetable is on the menu. Dr. Lloyd C. Shanklin, New York, N. Y. is the man who must be thanked. His cross breeding process de-sulphurizes the onion, eliminating the odor and the tears.

At last science has produced an odorless onion. By cross breeding, Dr. L. C. Shanklin succeeded in de-sulphurizing the vegetable, and it is the sulphur that causes the odor and tears.

Training Gun "Fires" Water Drops



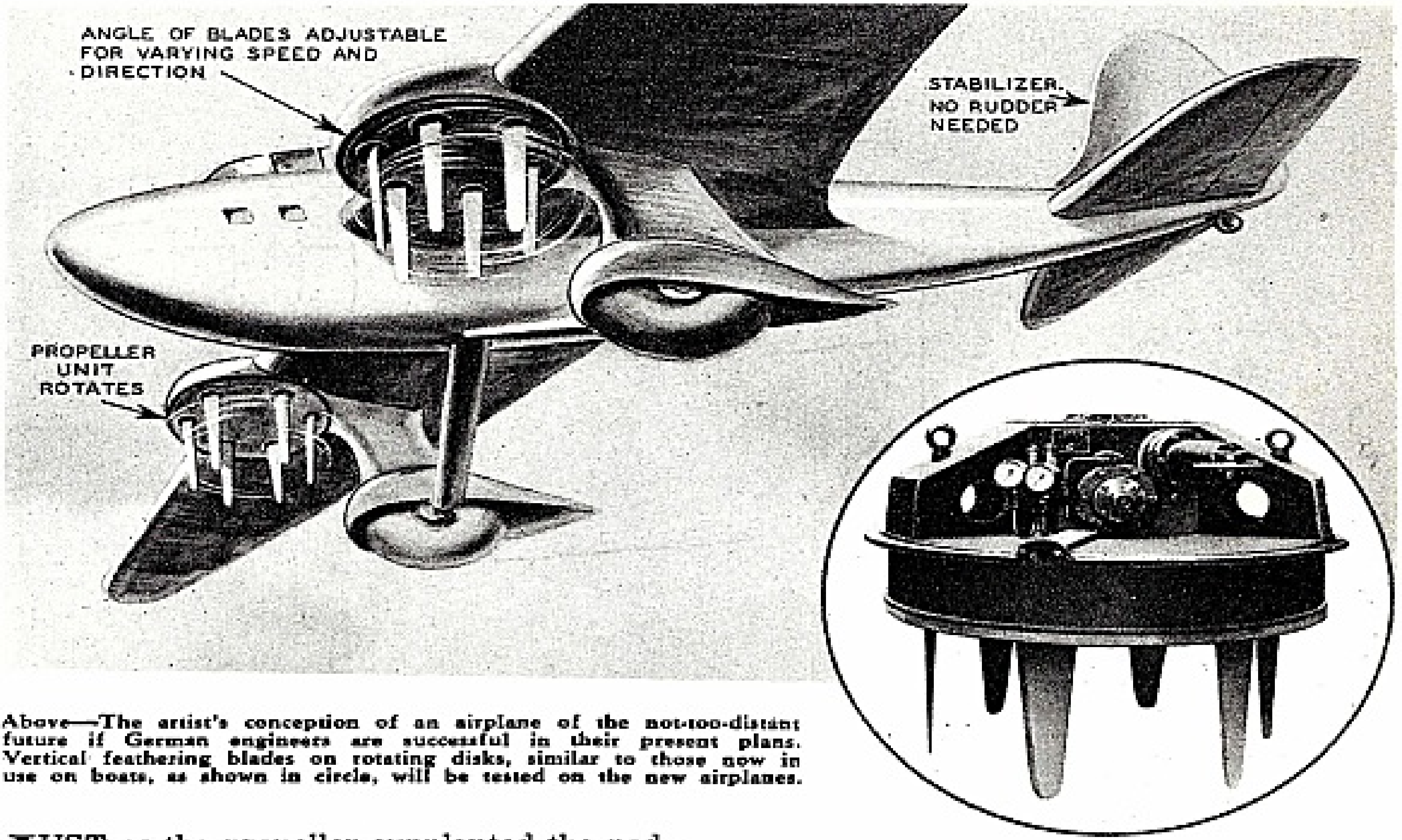
Waterdrops instead of bullets are used in this anti-aircraft training machine gun. A tiny plane drawn across a wire thus provides the same target as would a real plane in the air.

A WATER operated machine gun trainer for anti-aircraft drill has been invented by Capt. Frank T. Ripley of the New Hampshire National Guard to overcome the baffling optical illusion experienced by machine gunners in firing tracer bullets.

When fired at fast moving objects such as airplanes, tracer bullets seem to curve rapidly as they near the target, and bullets passing well in front appear to be direct hits. Capt. Ripley discovered that a high pressure stream of water presented a like illusion under similar conditions.

In the barrel of the machine gun he inserted a water tube controlled by a trigger arrangement. A miniature plane, drawn along a wire at a speed comparative to actual conditions, became the realistic and economical target.

Rotating Blades To Row Planes In Air


ANGLE OF BLADES ADJUSTABLE FOR VARYING SPEED AND DIRECTION
STABILIZER. NO RUDDER NEEDED
PROPELLER UNIT ROTATES

Above—The artist's conception of an airplane of the not-too-distant future if German engineers are successful in their present plans. Vertical feathering blades on rotating disks, similar to those now in use on boats, as shown in circle, will be tested on the new airplanes.

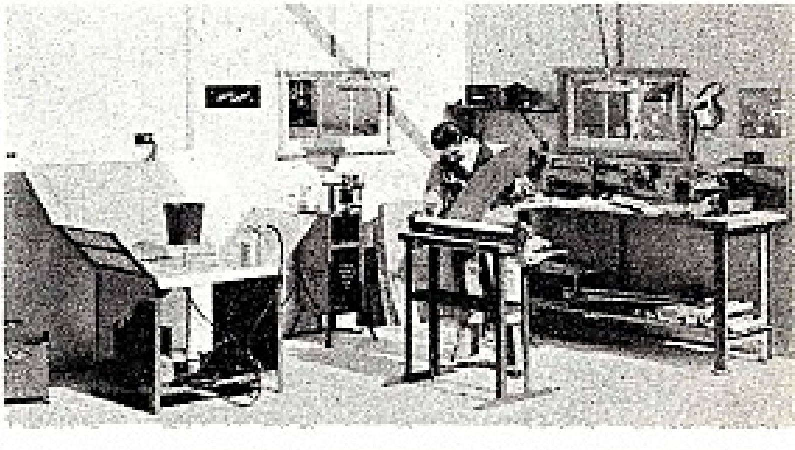
JUST as the propeller supplanted the paddle wheel, revolutionizing shipping, so are the new Voith-Schneider vertical featherblades, successfully tested in Germany, expected to supplant the propeller.

The blades, mounted on a rotating disk, have been used for the past two years on river and harbor boats with marked economies in operation coupled with a decided increase in maneuverability. As the disk rotates, the blades present a full face on the back stroke, and then assume a feathered position for the return circuit. Steering is accomplished by an adjustment which delays the feathering movement, the open faced blades thus pushing the stern of the vessel to starboard or port as desired.

The next step now being attempted by German engineers is the adaption of the vertical feathering blades to aircraft. Among the advantages claimed for the Voith-Schneider system is that it will permit greater streamlining, all motor mountings being concealed within the plane, and that it will eliminate rear rudder steering. The blades for aircraft will be larger and of much lighter construction than those in use on boats. Steering will be accomplished the same as in boats.

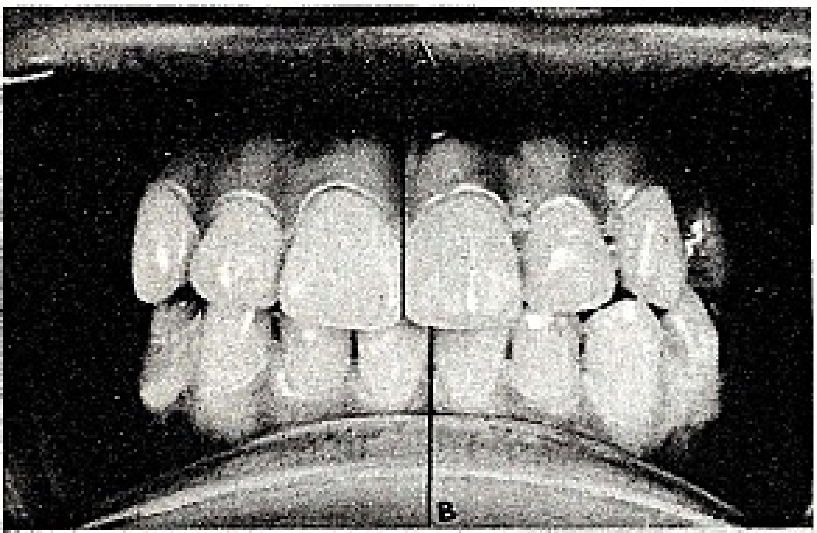
Metal Firm Devises Ideal Workshop

THE rapid increase in the numbers of persons adopting a metal working hobby has inspired one manufacturer to come out with a complete line of metal working tools designed to meet the needs of the home workshop. Included in the list of equipment is a metal former, combination pan and brake box, accessories for spray painting, bending, forming, punching and working flat stock.

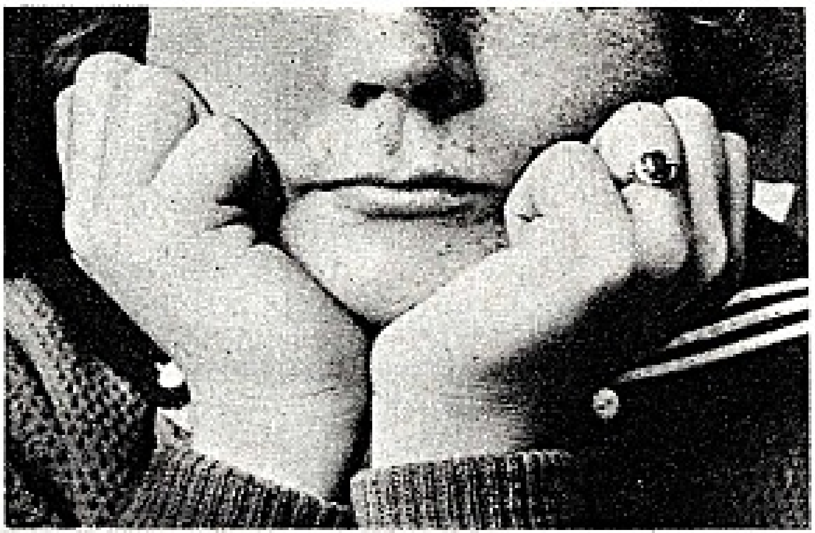


Everything the home work shop fan needs for working metal is included in this line produced by one manufacturer. All tools are capable of working metals up to 1/20" thick.

"CROOKED" TEETH--



Here is a fine set of teeth which their owner brushes twice a day, and yet they are slowly being ruined by the owner's habit of resting her chin in her hand. The pressure is causing the lower jaw to drift out of line.



Pictured here is the habit which is causing the teeth, shown on left, to drift out of alignment. The bone holding the teeth is easily distorted by constant pressure, with the result that teeth become uneven, chipped and irregular. However, it is this very softness of the bone which enables a dentist to realign the teeth.

Another bad habit common in both children and adults is that of resting the head against the knuckles of the hand. The habit is hard to break because few realize they have it.

IT DOESN'T seem possible that one could bend the hard bones of one's face by leaning face or chin on hand. Especially if you have sat at the ringside and seen some husky take a terrific wallop on his jaw without even blinking.

Bone in the prize ring and bone in the classroom are two quite different things. Adult bone is harder than a child's. But children's bone varies, also. Two youngsters for instance, may weigh ninety pounds each. One is three inches taller than the other; an effect of diet perhaps and of a ductless gland known as the pituitary. One has straight legs, while the ninety-pound weight of the other has bowed his legs. Deficient diet and perhaps deficient activity of the thyroid gland which controls the building of bones and teeth, are responsible. This child's bones—and teeth—are soft. The teeth decay readily and the bones bend easily. Moreover the bones are growing, and the growth is easily molded by pressure.

The gentle breezes of Southern California many bend a young tree; years later we see a giant Eucalyptus still bending as though before a light breeze. The twig was bent!

So the basic trouble when the child develops a crooked face or crooked teeth may be lack of calcium and phosphorous in the diet; a lack of vitamins or a derangement of the ductless gland functions.

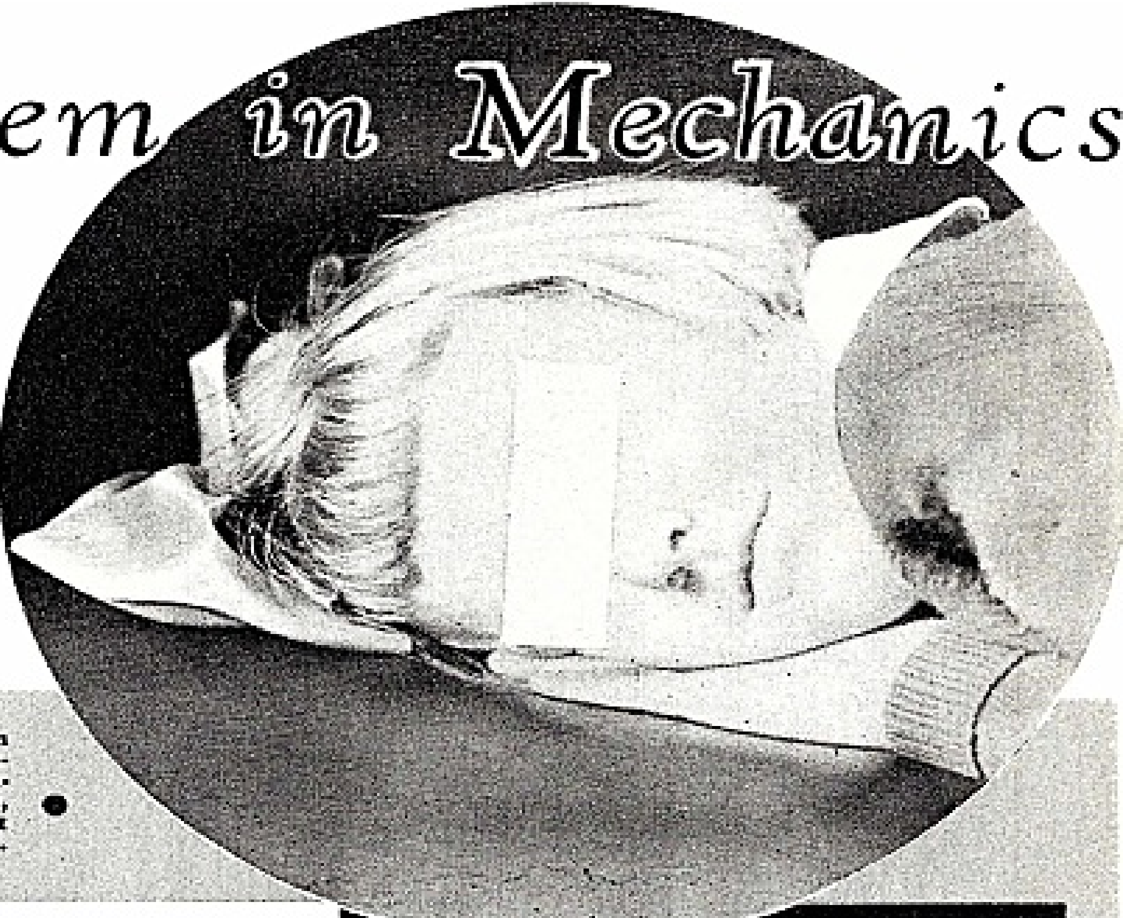
But the immediate cause of crooked teeth is usually some abnormal pressure. The pressure of the lip, if the child constantly draws it into his mouth and sucks it; the pressure of his thumb, if he sucks it; the pressure of his cheeks, and the lack of reciprocal pressure of the tongue from the inside, if he breathes with mouth hanging open; the pressure of chin or cheek in the cupped hand when reading, studying or "day dreaming"; all these will cause misplaced or "crooked" teeth.

Have you ever noticed that some folks'

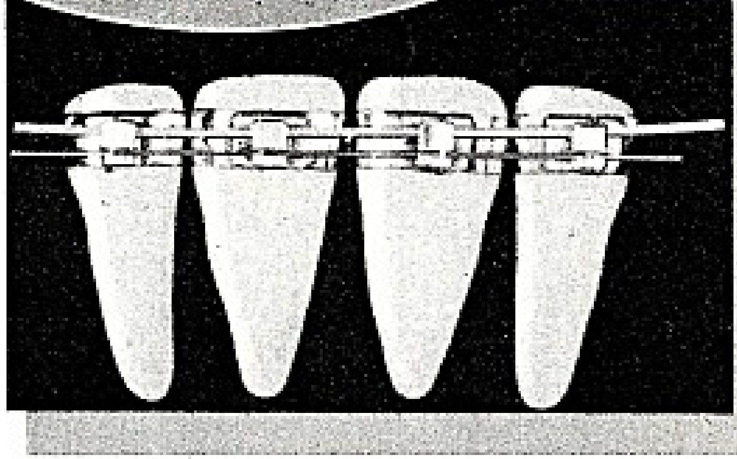
a Problem in Mechanics

by
DAVID W.
McLEAN, D.D.S.

EDITOR'S NOTE: *Dr. David McLean is Professor of Gnatho-dynamics of the Graduate Faculty of Dentistry at the University of Southern California.*



It is when you sleep in this position that teeth drift in the line of least resistance. Bone melts away under constant pressure, and when this happens, the dentist uses wire bands to direct the pressure back to normal center.



The upper wire in this photo can tilt the teeth from right to left, while the lower wire tips the roots inwards or outwards. The proper leverage is a delicate problem in mechanics.

noses point southwest or southeast? The vertical line of many faces, beginning between the eyebrows and running down over the crest of the nose to the center of the chin, curves to right or left. Such an individual sleeps, or has slept, on his stomach—resting one side of his face on the pillow or on his hand or arm. Perhaps the pillow is between face and arm, but that doesn't keep the pressure from making the face crooked, the upper lip flat or the chin receding.

Receding chins are not caused by weak character. Strong mechanical pressure during the period of growth often warps the mold into which nature is pouring the concrete framework of the chin, jaws and face.

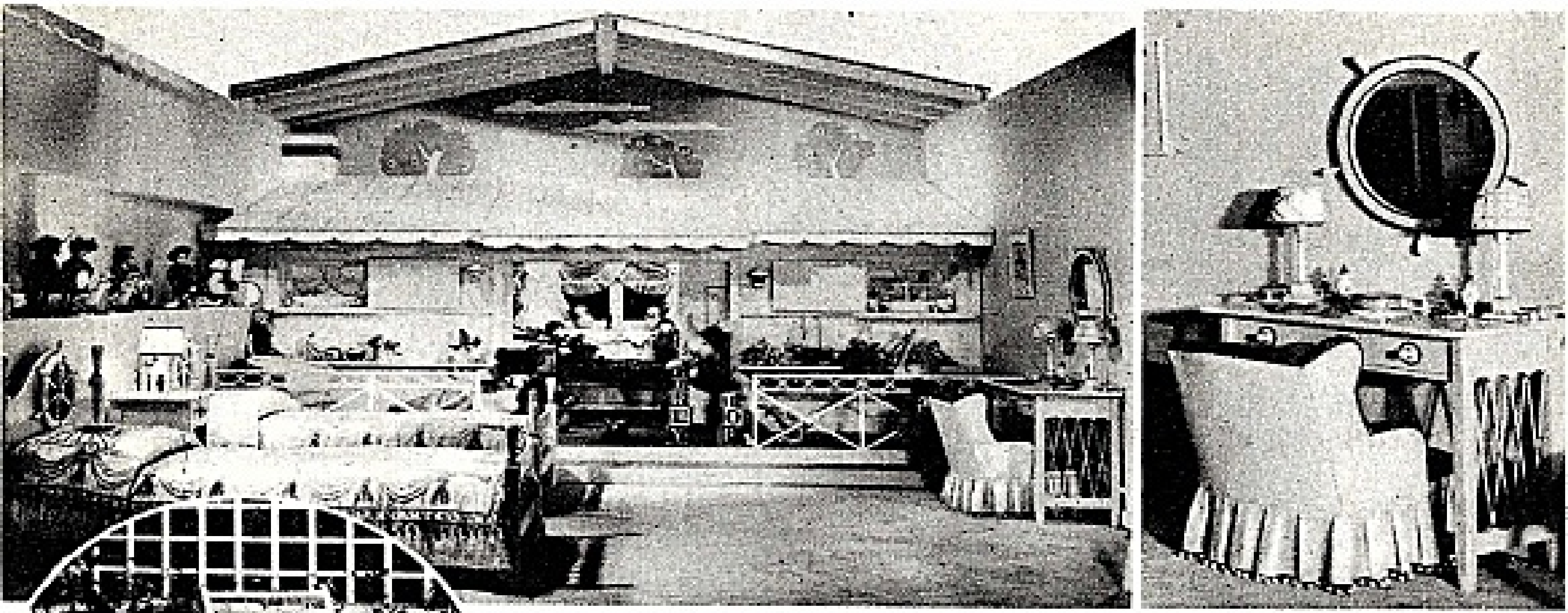
But bone isn't concrete. It is alive and growing. The hard dome of the skull is strong enough to stand the weight of the head during the hours of sleep, just as the dome shape of an egg enables it to stand pressure between the palms of your hands. But the bones of the face are thin, and for the most part, hollow. During childhood, while the temporary teeth are still in place, the permanent teeth are forming in hollow spaces in the bone above. Remove the outer thin plate of bone and you would readily see how faces can be warped out of shape and the teeth made crooked by unnatural pressure.

The breaking of the postural habits of children requires patience. The leaning posture is assumed in moments of relaxation or when the mind is busy with something else. Sleeping habits are elusive—difficult to catch. Often the youngster sleeps on his back during the early part of the night, and again when you go into his room in the morning; but through the middle part of the night, he turns face downward. Books piled up in bed on each side of him, or his pajamas pinned to the bed covers, so he cannot turn completely over, will usually break the habit, in time.

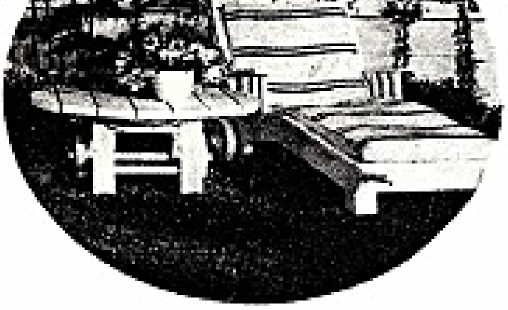
If pressure is continuous, it does more than warp the bone. It stimulates cells of microscopic size, in the flesh covering the bone.

[*Continued on page* 120]

Movies Set Pace In Furniture Ideas



Home workshop fans should get several ideas for furnishing the nursery from this movie set used in Shirley Temple's picture, *Curly Top*. The photo on right gives a closeup of the nautical dresser, while the one below shows some handy garden furniture.



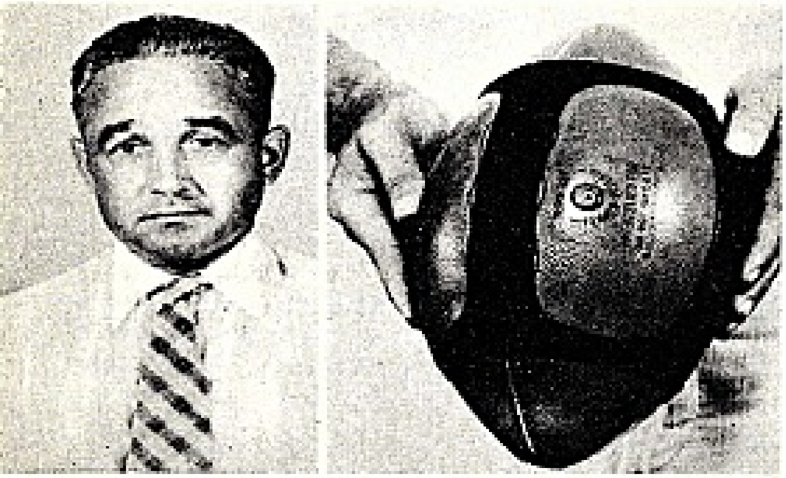
CINEMA-LAND, in its never ceasing hunt for something new—something different—has already established itself as a leader in women's fashions, and now is becoming a leader in home furniture designing. Workshop fans, eager for new ideas, will find the local moving picture house a fertile field for study. An outstanding example of what the motion picture industry is doing for home planning can be found in the current Shirley Temple picture, *Curly Top*, in which Jack Otterson, Fox Film art director, has fashioned several unusual sets.

In designing the bedroom set for the child star, Otterson chose a nautical theme which lends itself to several distinctive effects easily duplicated in the home work shop. Braided ropes replace the customary spindles across the foot of the bed and on the sides of the dressing table. Miniature belaying pins, easily turned on any lathe, make the attractive bed posts, and are even used as knobs on the dresser drawer. The spokes of a nautical steering wheel surround the mirror and circular picture frames, while the wheel itself is used to decorate the head boards of the beds.

In designing the furniture for the exterior sets, Otterson went completely rural, following a wheelbarrow motif in fashioning a comfortable lawn chair and service table. Two wood wheels form the back legs of the chair, while the long arms which support the leg rest terminate in wheelbarrow handles. Wheels are also used on two legs of the table.

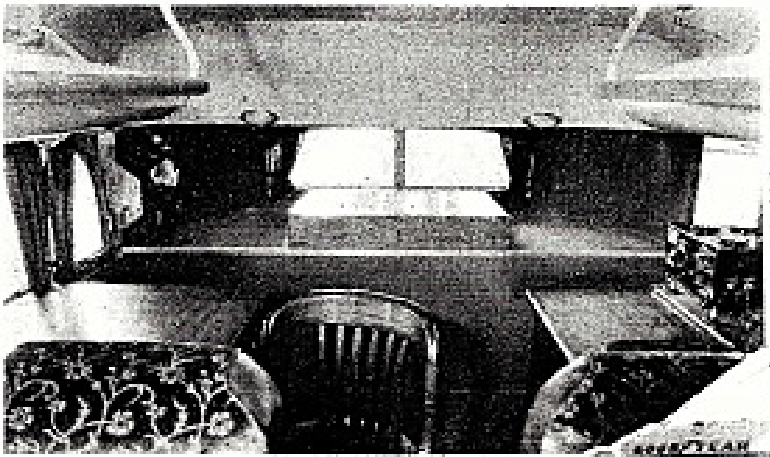
Footballs Will Wear Raincoats

RUBBER raincoats for footballs will be the latest thing on the gridiron this fall as the teams struggle to get in as much practice as possible, rain or shine. The cover was invented by Arthur (Dutch) Bergman, coach at Catholic University. It weighs only two ounces and the rubber prevents the ball from becoming slippery when wet.

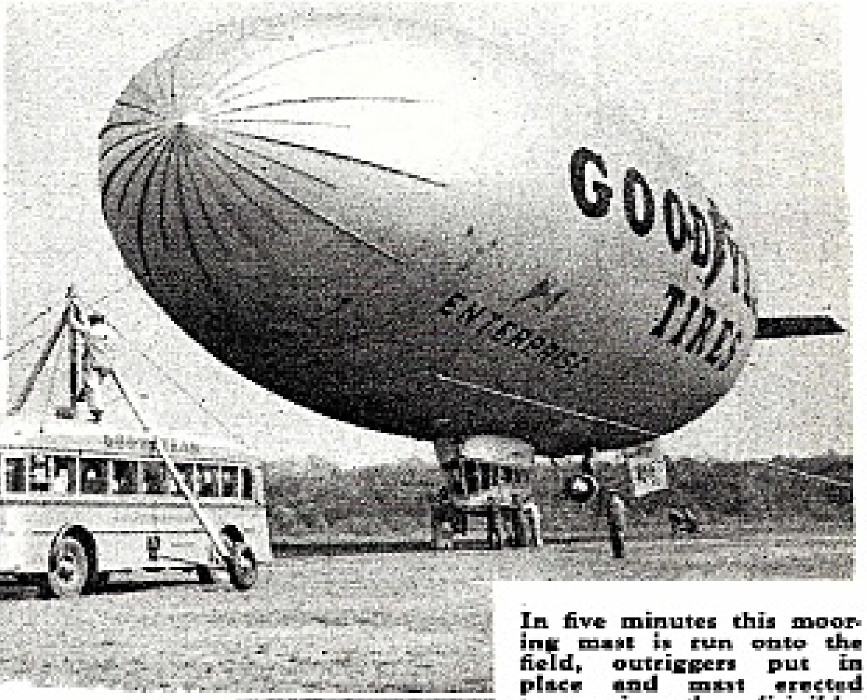


Arthur (Dutch) Bergman, left, football coach, is the inventor of the football raincoat, right. The rubber strips keep the ball from getting slippery during wet weather practice.

Whole Flying Field Housed In One Bus



This is "headquarters" for the portable landing field. In this office in the rear of the bus is a weather bureau, a radio station, first aid supplies, and full office equipment. Overhead can be seen two of the four bunks, while in the partition below the weather charts is a light plant.



In five minutes this mooring mast is run onto the field, outriggers put in place and mast erected to receive the dirigible.

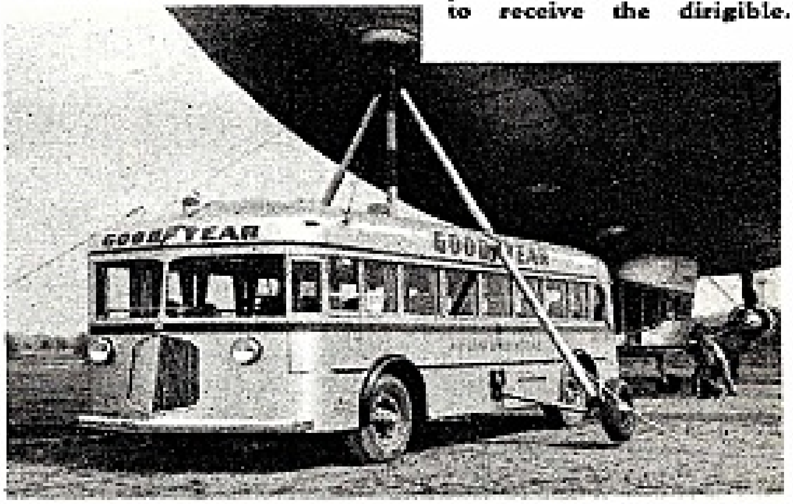
A COMPLETE airport on four wheels is the Goodyear Tire and Rubber Company's contribution towards the advancement of dirigible flying ships. Everything necessary for the servicing and guidance of large aircraft is contained in the portable unit.

The bus was designed primarily to serve as a portable mooring mast. For this purpose it is equipped with a retractable mast and two side outriggers for stability in cross winds. The mast can be erected in five minutes, and is 17 feet high when extended.

Next the 11,220-pound bus was equipped with a radio transmitter, Station WMEW, and receivers, providing two-way communication at all times.

A weather bureau was then installed which includes complete facilities for drawing weather maps, and plotting Department of Commerce Airways data. First aid equipment, a spare ship propeller, an auxiliary mooring mast for field erection, a special blower for maintaining envelope pressure when the ship is at mast, fuel and lubricant for ship engines and a miniature light plant of 1,000 watt capacity were then installed.

In spite of the fact that the bus is no larger than the conventional passenger bus, room was then found to provide seats for 17 passengers, bunks for sleeping four men, desk, typewriter and office fixtures for the operations manager, and a built in lavatory.

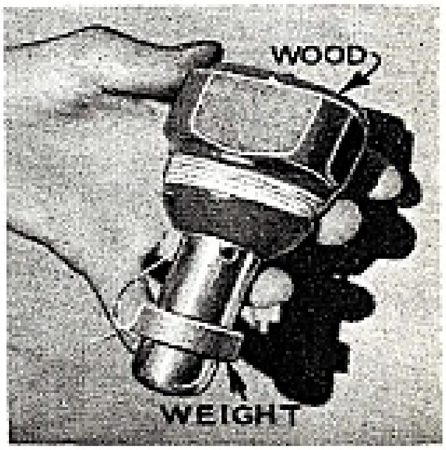


A close-up of a dirigible anchored to the portable mooring mast. The bus carries everything needed to service the dirigible and in addition can carry a full crew of 17 men.

Midget Buoy Marks the Spot

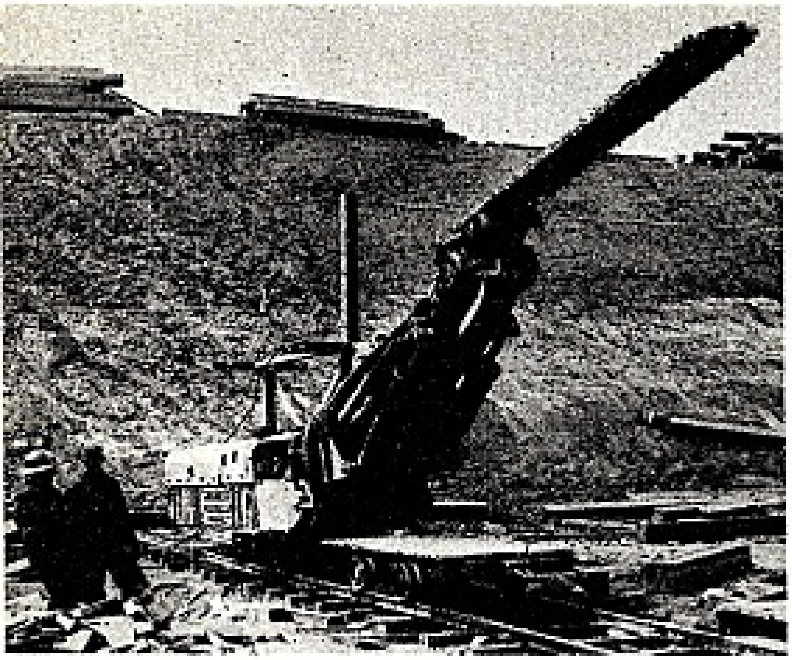
A PORTABLE buoy which fits into the tackle box and is used for marking favorite fishing spots or position of sunken objects is now being offered.

The buoy operates automatically, unreeling as soon as it enters the water.



This fishing buoy automatically unreels when placed in water. The weight anchors it at desired spot.

Giant Mechanical Borer Cuts Tunnels 32 Feet In Diameter



This mechanical borer, used for tunneling at the Fort Peck dam, can cut to a diameter of about 16 feet. When an extension arm is used, the diameter is increased to 32 feet.

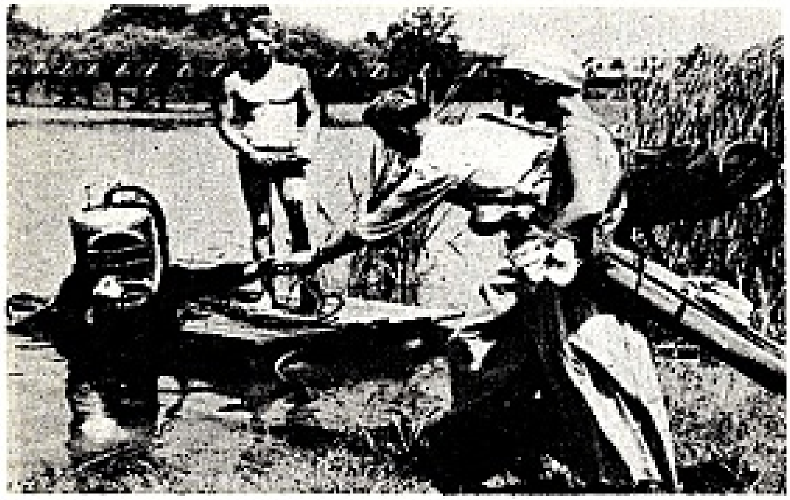
A GIGANTIC mechanical borer equipped with endless chain saws is engaged in cutting tunnels at the Fort Peck dam in Montana. Mounted on hydraulic rams, each saw may be twisted and turned as it bores, eating out a hole of any desired size and shape up to its 32 foot maximum diameter.

The borer is mounted on movable cars, and powered by an electric motor. A long arm supports the chain saw which eats its way into the earth, the arm rotating on a disk as it does so. In this manner the arm can describe a full circle, the diameter of which can be controlled from the cab.

Diving Helmet Provides Steady Job

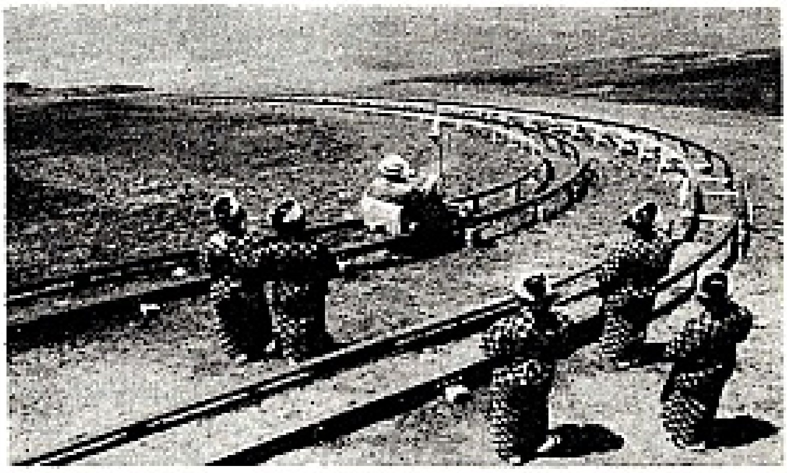
JOHN CERBACK of Portland, Oregon, made a diving helmet from the top end of a hot water tank, a section of garden hose and a pressure pump, and with that he solved his own unemployment situation.

The solution came in the form of a water hazard on one of Portland's golf links. Its thirty foot depths soon became paved with the golf balls of ambitious but unfortunate golfers. Then Cerback donned his diving helmet and plunged to the rescue. From the murky water he retrieved scores of balls at ten cents apiece, and now he has built up a profitable business. His partner mans the pump.



This homemade diving helmet has built up a steady job for John Cerback, shown with helmet. He has stationed himself at a water hazard and gets 10 cents for each ball retrieved.

Suicide Brink Gets Roller Coaster



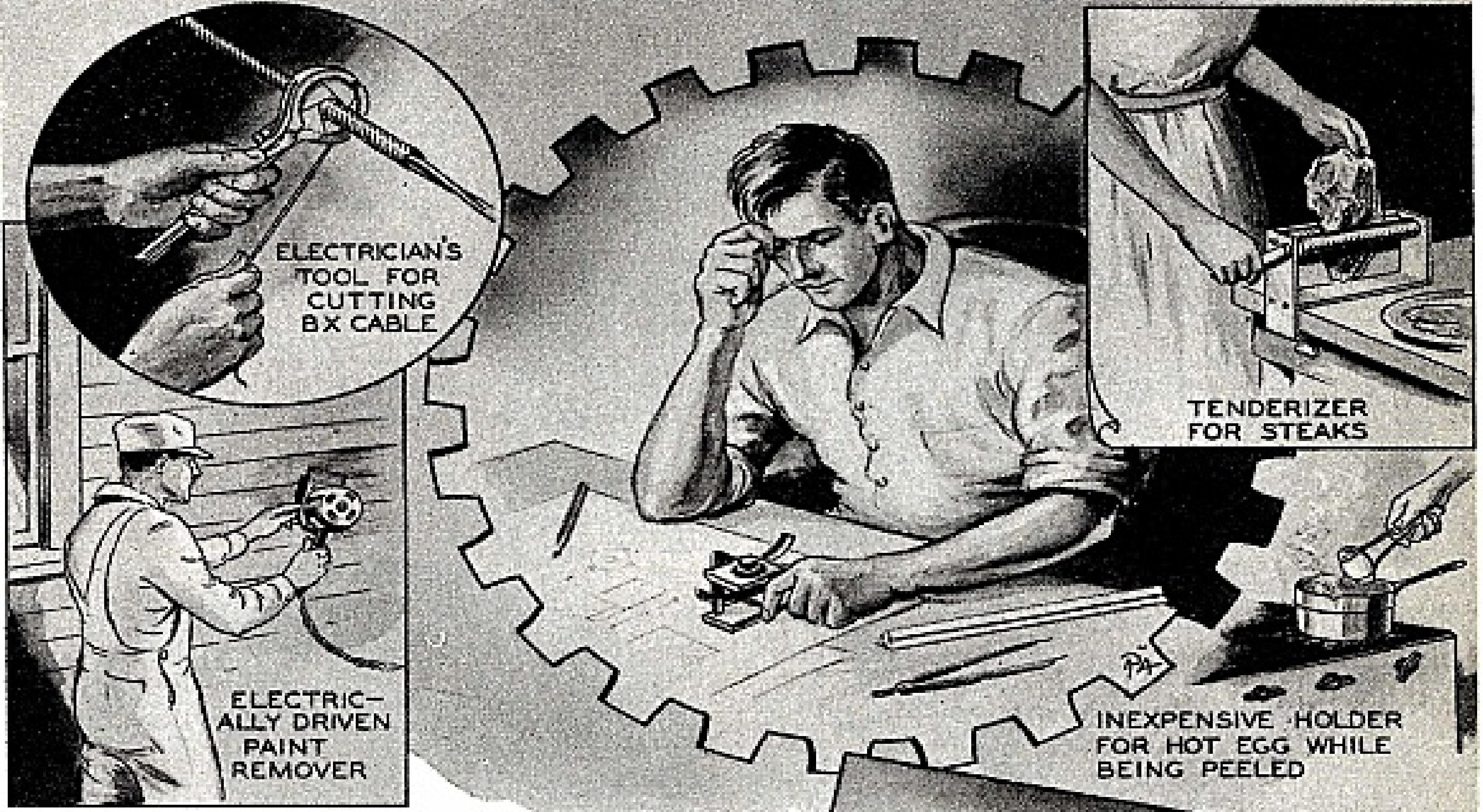
It is a long hard climb to the brink of Mihara-Yama crater, scene of hundreds of suicides, but the way back is made easy by this 40 mile per hour shoot-the-chutes to the base.

THE gripping fascination with which the Japanese regard the Mihara-Yama crater on the island of Oshima, 59 miles from Tokyo. where more than 300 suicides occurred in two years, has led to the establishment of a unique and profitable enterprise—a roller-coaster down the outer slope of the volcano.

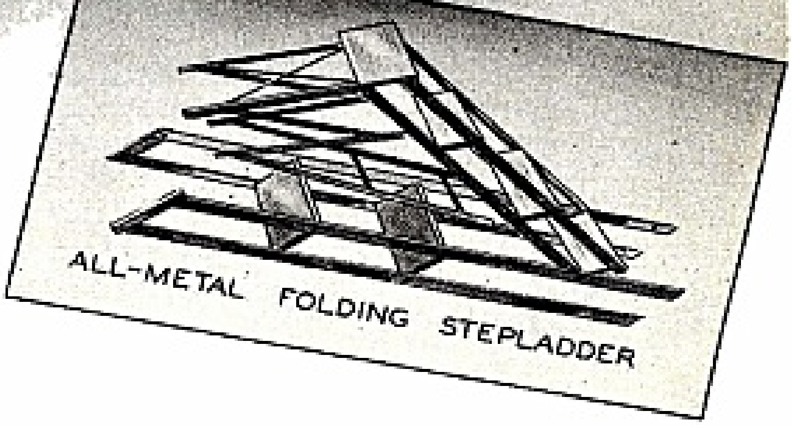
In addition to the 300 persons who hurled themselves to their deaths in 24 months, there were several hundred more who were forcibly restrained from making the leap. When it was discovered that the possibility of witnessing suicidal leaps into the smoky depths of the volcano was attracting hundreds of morbidly curious tourists daily, some means was sought to turn suicide into a profit. At first camels were used to transport the tourists to suicide brink, but soon the crowds were too great.

Now, however, the visitors can walk to the summit, and when satisfied, return to the base in a 40 mile per hour shoot-the-chute.

APPLY Your MECHANICAL ABILITY To These NEEDED INVENTIONS


ELECTRICIAN'S TOOL FOR CUTTING BX CABLE
TENDERIZER FOR STEAKS
ELECTRICALLY DRIVEN PAINT REMOVER
INEXPENSIVE HOLDER FOR HOT EGG WHILE BEING PEELED
PA

If you yearn to invent, spend your time on some of these needed devices rather than on some tricky gadget that might be patentable, yet never profitable. When in need of expert advice on patents and inventions, write to the Patent Editor, Modern Mechanix & Inventions Magazine, Minneapolis. envelope. Include rough sketches to help explain your ideas.



SO KEEN is the competition for new inventions that a number of manufacturers have resumed their pre-depression practice of advertising for new ideas. Where ten thousand dollars was paid for an idea fifty years ago, a hundred thousand would be paid today.

The American housewife is still among the best customers that the inventor has. She not only readily buys new articles but she is constantly in need of new gadgets. This time she needs a simple little ten cent article with which she can hold a hot egg after it has been removed from the scalding water and while it is being peeled. There is $50,000 in royalties awaiting the man who can do the trick.

Electricians have long since been looking for a special tool with which to cut BX cable, the metal sheathed wire now being used for house wiring. A tool is needed that will cut the metal covering rapidly without damaging the wires inside. Awaiting the right answer to this problem is at least a $30,000 profit.

Pressed metal manufacturers are looking for an all-metal step ladder that can be folded up to occupy about one-fifth the space taken by present wooden ladders.

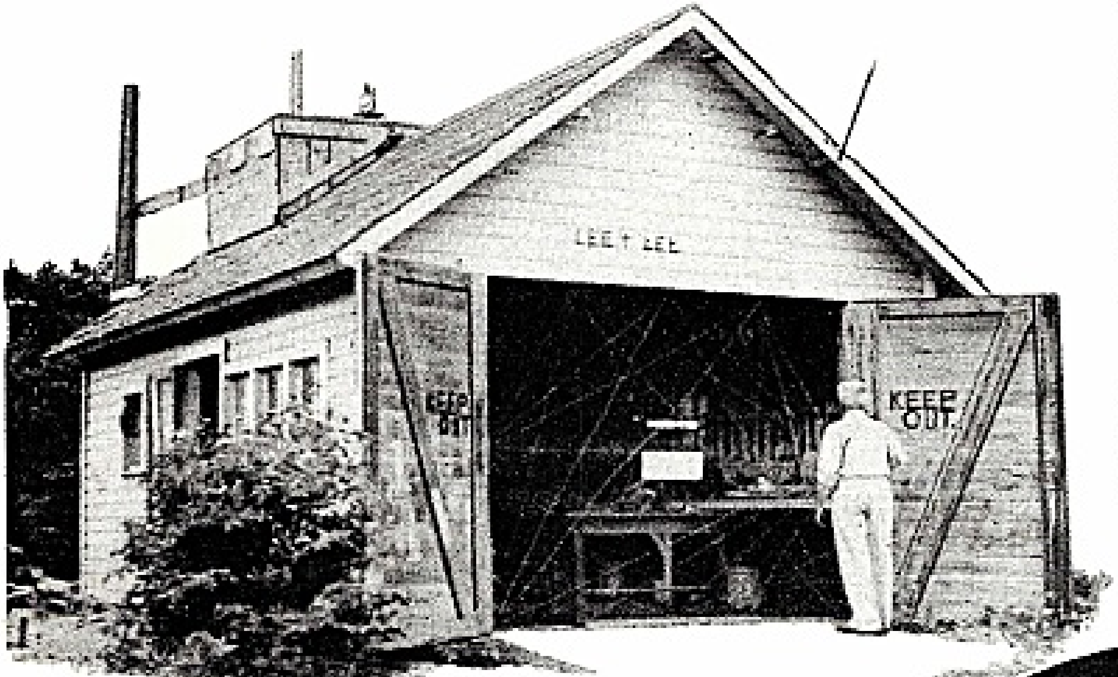
The man who can invent an effective eraser for use on fountain pens can ask his own price.

The market is still big and wide for the bed springs that will not squeak. Would it not be possible to mount these springs in rubber so that they would be silent? Here is

[*Continued on page* 142]

Boy Genius Builds Complete

From odds and ends of discarded equipment 13-year-old Franklin Lee has built a remarkably complete scientific laboratory. A few of his many successful electrical projects are described in this article.



In this garage-laboratory Franklin Lee, Granite Falls, Minn., "boy-Edison," carries on his electrical and chemical research experiments. A network of charged wires keeps out the loiterers.

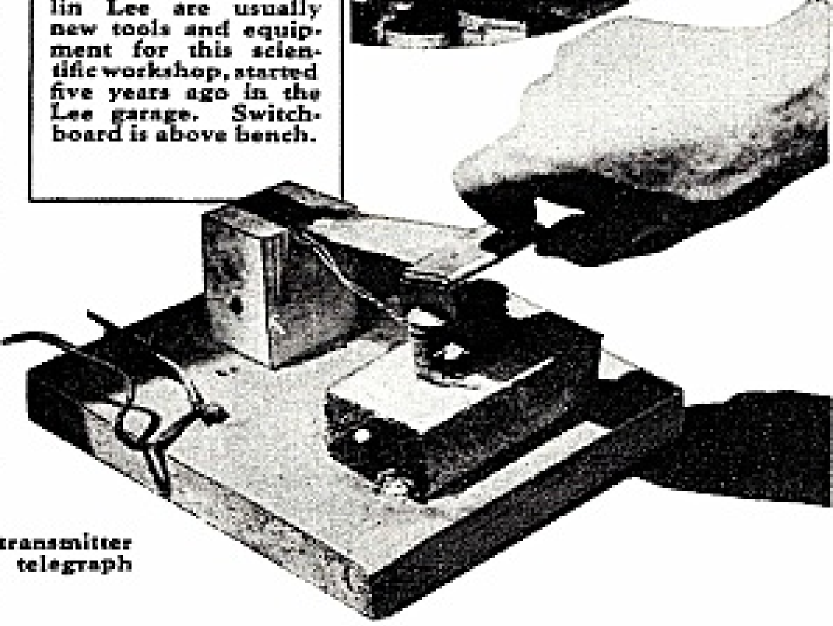
NIMBLE fingers, an inventive mind, and the urge to experiment have brought to 13-year-old Franklin Lee, Granite Falls, Minn., electronic wizard, a scientific research laboratory that would do credit to a college student of science.

In the well-lighted interior of his garage workshop powerful homemade electric motors turn lathes and grindstones. Standing by in one corner, ready for instant use, is an electromagnet capable of lifting a hundred pounds. Transformers of different sizes and voltages hum merrily in their baths of cooling oil, while in one corner metal glows white-hot in a homemade electric arc furnace. From discarded electrical equipment, auto parts, and odds and ends of cast-away materials Franklin built them all.

But Minnesota's "boy-Edison" is not strictly a scholarly type of boy. Invading nearby dumps and junk piles, he salvaged scraps for possible future use. Electrical devices, given to him by friends, were dismantled for the wire, bolts, nuts and screws. After completing and testing each electrical gadget, the youth would tear it down and build other experimental apparatus.

At ten, Franklin built his first successful

Christmas and birthday gifts for Franklin Lee are usually new tools and equipment for this scientific workshop, started five years ago in the Lee garage. Switchboard is above bench.



Complaints from neighbors put an end to Franklin's spark transmitter experiments. This is the key used in his early radio and telegraph projects—just nails, bolts, and a piece of spring steel.

Electrical Laboratory

by ORMAL I. SPRUNGMAN

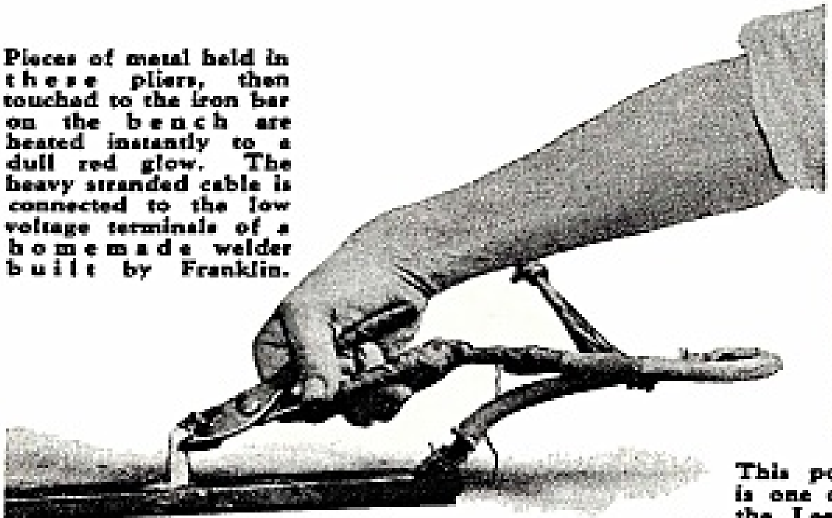
motor. Plenty of odds and ends went into the motor—watch parts, discarded scrap iron, a knitting needle for a shaft. He had to splice together short lengths of wire for the windings. The motor was of makeshift design, but *it worked.*

Many of Franklin's projects were far from mechanically perfect since he labored under difficulties, utilizing only the materials on hand. Everything that he has done or built, however, has been successful because he understands principles.

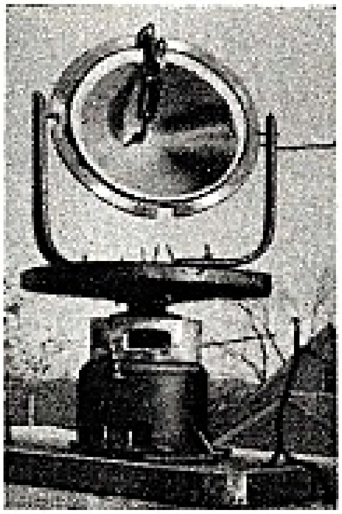
Franklin's collection of workshop tools grew as a reward for his hard work. Christmas and birthday gifts usually meant tools and new shop equipment. These he has mounted in appropriate racks along the walls.

When visitors call, he is unaware of their presence. He has had a number of helpers, but none seem to be able to follow his pace. The work is either too difficult, too dirty or too tiresome to interest his young friends. To ward off bothersome youngsters or curiosity-seekers, Franklin has covered the garage opening with a network of wire and hung up "Danger—High Voltage" signs. When the

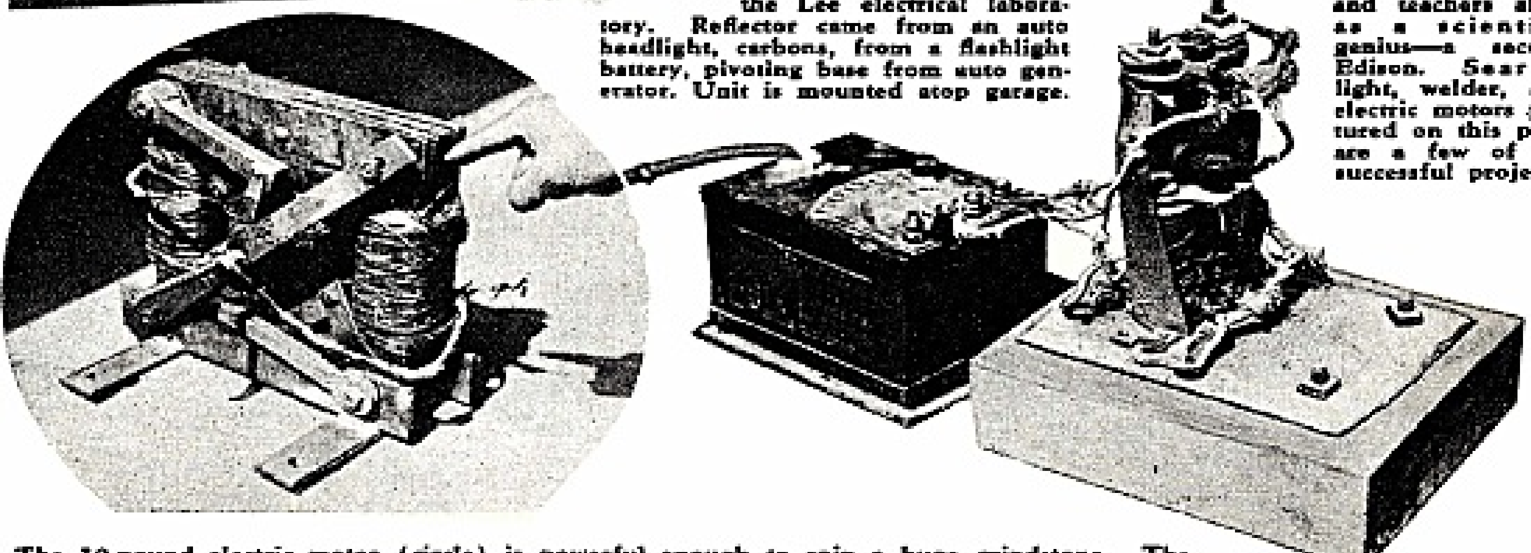
At the age of thirteen Franklin B. Lee of Granite Falls, Minnesota is hailed by friends and teachers alike as a scientific genius—a second Edison. Searchlight, welder, and electric motors pictured on this page are a few of his successful projects.



Pieces of metal held in these pliers, then touched to the iron bar on the bench are heated instantly to a dull red glow. The heavy stranded cable is connected to the low voltage terminals of a homemade welder built by Franklin.



This powerful searchlight is one of several made in the Lee electrical laboratory. Reflector came from an auto headlight, carbons, from a flashlight battery, pivoting base from auto generator. Unit is mounted atop garage.



The 30-pound electric motor (circle) is powerful enough to spin a huge grindstone. The motor at the right, made three years ago from watch parts, scraps of iron, and a knitting needle, is controlled by a toy train transformer. Scrap wire was spliced together for the windings.

CHEMISTRY LAB OCCUPIES CORNER OF GARAGE

proper switch is thrown, those who touch the wires in trying to enter receive an unpleasant shock.

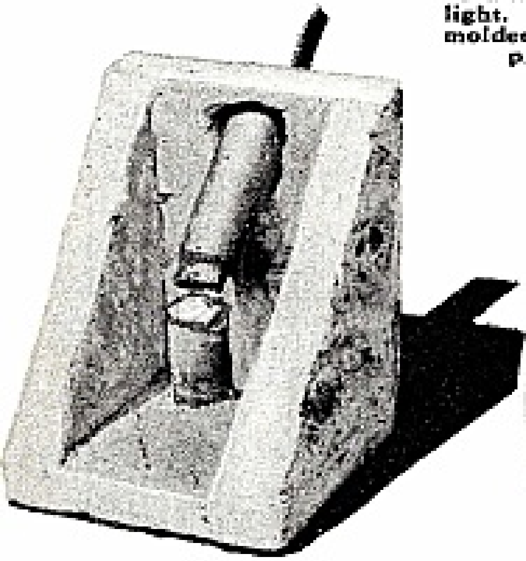
On the roof of the garage-laboratory is set up a powerful searchlight, one of several built from odd parts. The wooden base revolves on the shaft of an old car generator. Carbons removed from discarded flashlight batteries are used in the arcs. The reflector is from an auto headlight, but the collector rings, the carbon holders and other parts were designed in the boy's workshop. One night when he and several friends mounted a homemade searchlight atop the Granite Falls courthouse, residents ten miles away saw the beam.

He recently tore down several burned-out transformers, reconstructing three larger ones with differing voltages and amperages which are housed in tall crocks and discarded jars filled with oil. These transformers proved so efficient that he has used them consistently in laboratory experiments.

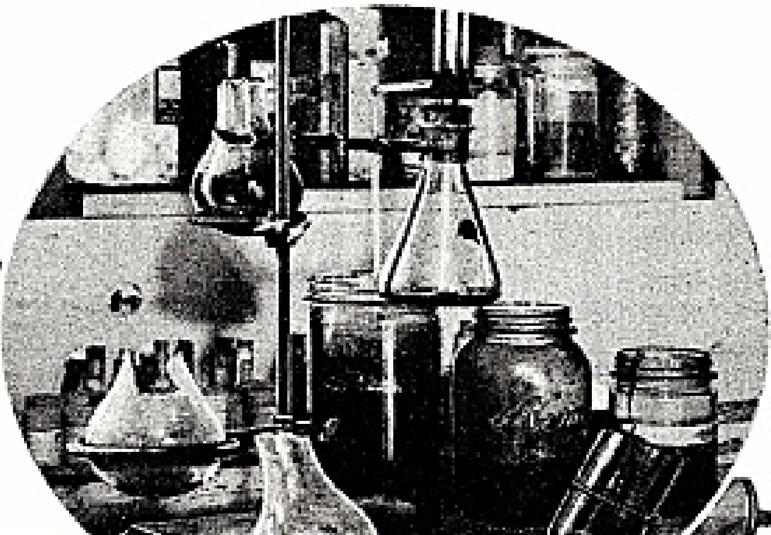
Franklin has made three complete electric motors and has rebuilt two commercial motors, one of which runs a tiny lathe. His most recent motor, requiring nearly a summer to assemble, weighs 30 pounds and has interchangeable armatures with sufficient power to spin a grindstone. A simple homemade rheostat, built into a wooden crate, regulates the speed.

Some of the more recent projects include arc lights, arc furnaces, spectrum testers and static machines. All of the switches, condensers and circuit breakers which he uses are products of his versatile mind and stubby

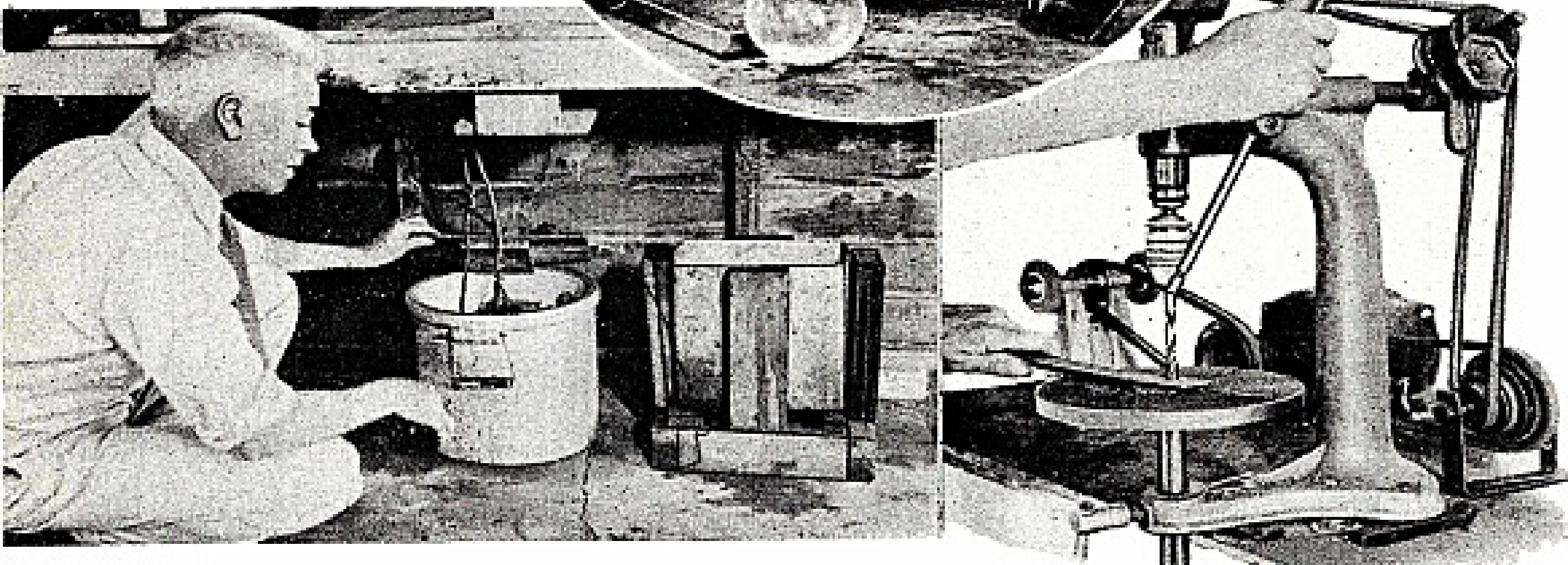
[*Continued on page* 128]



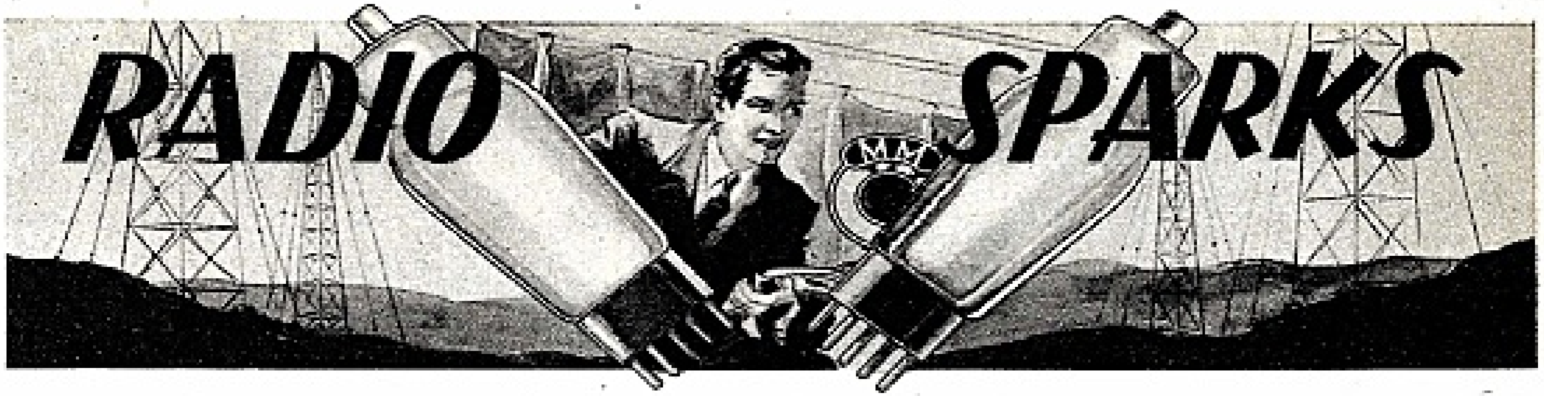
For spectrum analysis Franklin made this arc light. The frame was molded with asbestos and plaster of Paris.



Countless chemical experiments, often with homemade materials, have been performed by Franklin in the chemistry corner of his garage laboratory. Note that some of the flasks used are nothing more than electric light bulbs with the bases cut off and the filament supports removed. Chemicals stored in mason and jelly jars fill laboratory shelves.



To halt experiments which might prove hazardous, Mr. Lee is compelled to stay up many a night, poring over his son's books. He is seen here examining one of Franklin's oil-immersed transformers. A homemade core for another transformer is at the right of the crock jar. Most prized of the workshop power tools is a bench drill press. Pulleys reduce the speed.

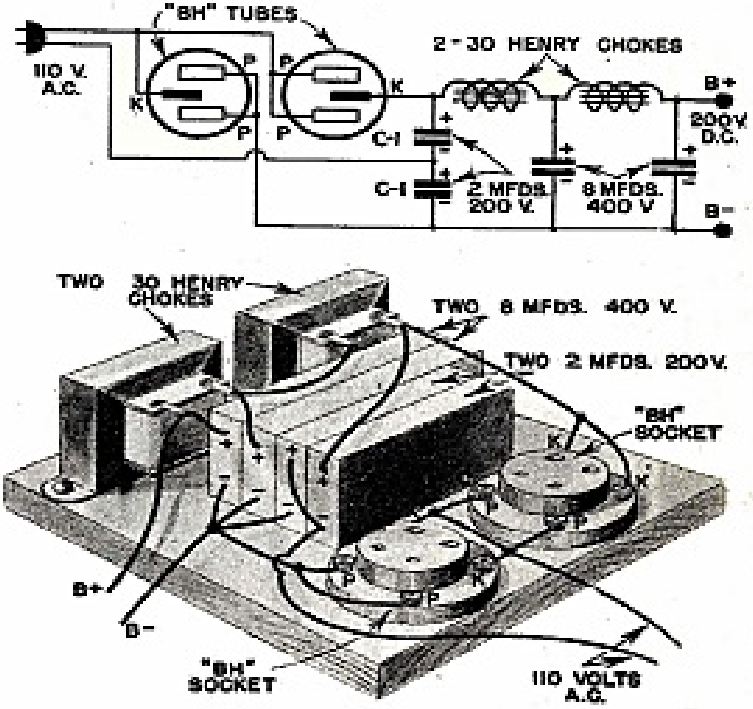


RADIO SPARKS

Transformerless "B" Supply Uses Two Low-Priced BH Tubes

FULL wave rectification at double voltage is obtained with this simple radio power pack. Two BH gaseous type rectifier tubes, now available at less than one dollar each, replace the usual high-cost power transformer. With an input of 110 volts A. C., a pure D. C. output voltage of around 200 volts can be obtained, the maximum current being dependent upon the capacities of the two voltage-doubling condensers. The circuit is simple, as these gaseous tubes do not require a filament supply.

A ground can be used on a radio set connected to this power pack only if a fixed condenser of about .1 mfd. is placed in series with the ground lead. At one position of the outlet plug the plus side of the output is connected to the grounded side of the power line. If the negative output lead were also grounded as through a radio set, a short circuit would result.

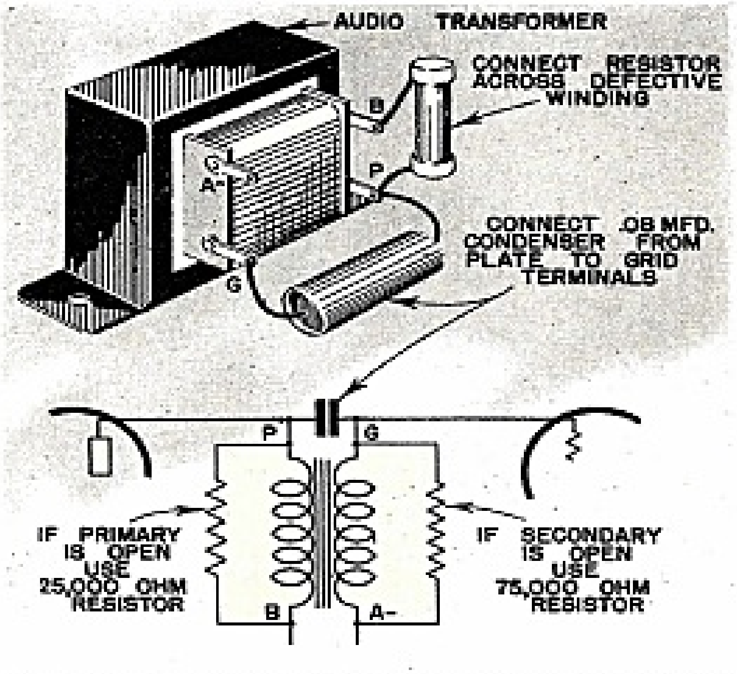

"BH" TUBES
2 - 30 HENRY CHOKES
110 V. A.C.
K
P
P
P
P
K
C-1
C-1
B+
200V. D.C.
2 MFDS. 200 V.
8 MFDS. 400 V
B-
TWO 30 HENRY CHOKES
TWO 8 MFDS. 400 V.
TWO 2 MFDS. 200V.
"BH" SOCKET
B+
B-
"BH" SOCKET
110 VOLTS A.C.

Current outputs of up to 100 ma. at 200 volts can be obtained with this transformerless power pack on 110 volts a.c. On 220 volts a.c. the output voltage would be doubled. Maximum output current is computed from the following formula: Current (in amperes) — .00000628 x frequency (cycles per sec.) x line voltage x capacity of C-1 (mfd.) For 60 cycles, 110 volts a.c., and 2 mfd. condensers at C-1, current would be about .08 amperes or 80 milliamperes.

Temporary A.F. Transformer Repair

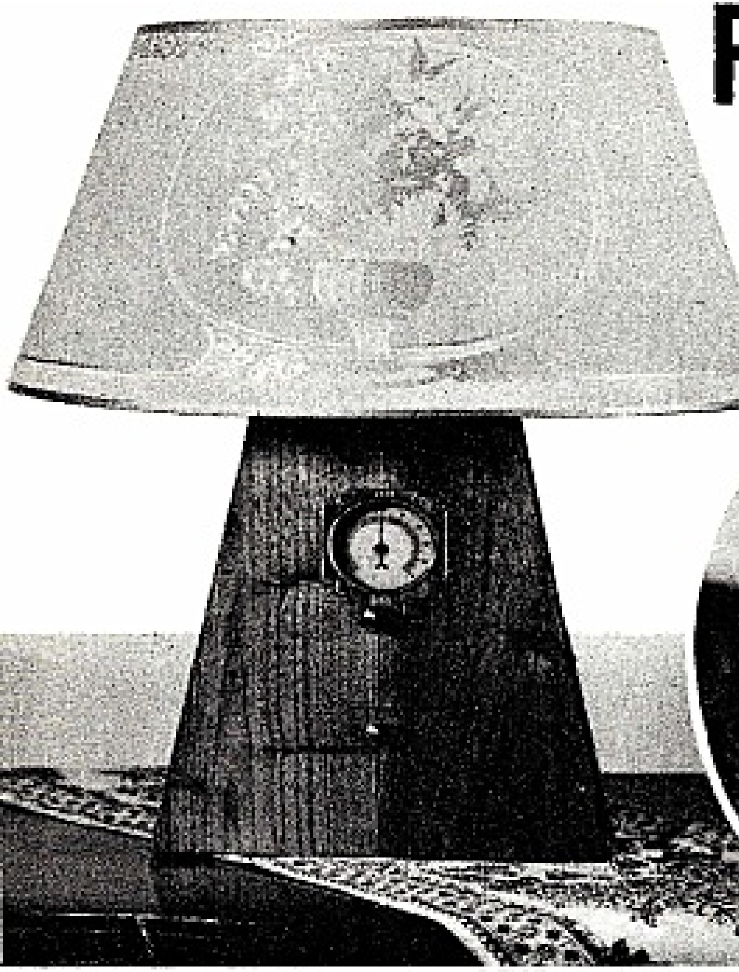
A BURNED-OUT or otherwise damaged audio transformer may be replaced temporarily or even permanently by resistance coupling in a few minutes, simply by soldering in two resistors and a condenser.

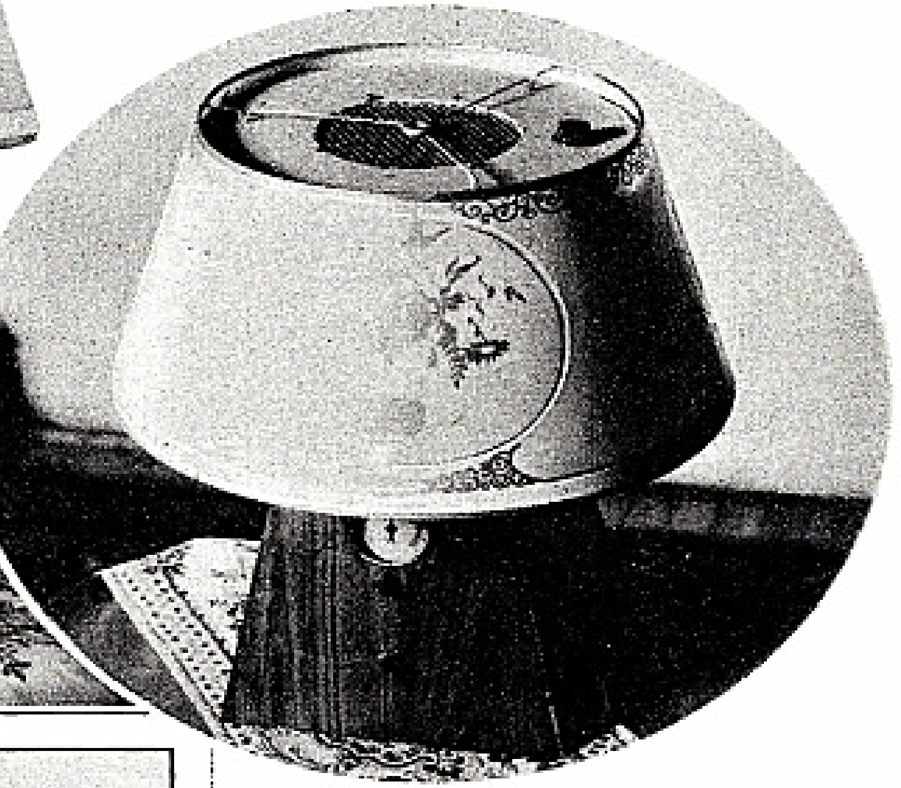
If the primary winding is open, connect across it a 25,000 ohm, 1 watt resistor. If it is the secondary that is damaged, shunt across it a 75,000 ohm resistor, making connections as indicated in the diagram at the left. Whether one or two resistors are used, it is necessary to connect a .08 mfd. fixed condenser between the P and G posts to bridge over the transformer.

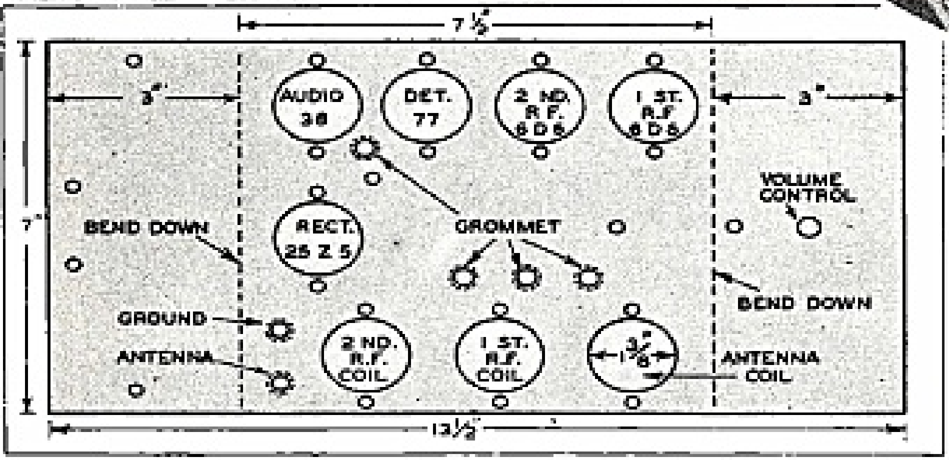

AUDIO TRANSFORMER
CONNECT RESISTOR ACROSS DEFECTIVE WINDING
B
P
G
A-
G
CONNECT .08 MFD. CONDENSER FROM PLATE TO GRID TERMINALS
P
G
IF PRIMARY IS OPEN USE 25,000 OHM RESISTOR
IF SECONDARY IS OPEN USE 75,000 OHM RESISTOR
B
A-

If a.f. transformer primary burns out, make temporary repair as shown in top sketch, without removing transformer.

Five-Tube Radio







The beauty of design of this table lamp radio is clearly demonstrated by the photo at the upper left. The shade rests upon the pressed wood baffle of the six-inch magnetic speaker. Tone control may be seen in photo in circle. Speaker grille is piece of hardware cloth. Enamel bottom side of baffle white to reflect light. Volume control is lowest knob on front of set. Cabinet dimensions are: Bottom—9½" wide x 10" deep; Top—5" wide x 6" deep; Height—12½". One-half inch walnut was used here for cabinet. Cut out strip of electralloy to dimensions at left and bend to form chassis. An electralloy shelf is mounted at bottom rear to support the filter condensers and filter choke, being held in place by angle brackets.

NOVEL as well as useful is this five-tube all-electric radio receiver. Built into an attractive walnut table lamp, the speaker is concealed inside the shade. A simple but high gain tuned radio frequency circuit brings in police calls as well as local and distant broadcast band programs.

Electricity ordinarily wasted in the filament resistor of the midget radio is used here for the electric light bulb, making the cost of operation of this radio negligible.

A 25Z5 rectifier tube in a voltage doubling circuit gives nearly 200 volts of pure direct current, resulting in greater sensitivity and more power output into the speaker than is available in the ordinary midget radio. A tone control is mounted on the speaker baffle.

With good radio parts available at new low prices from mail order radio supply houses, this receiver complete should not cost more than fifteen dollars—less if you already have a few parts on hand. Although the set as pictured here can be used only on 110 volts a. c., it is possible to add a simple switch and use the set on a 110-volt d. c. line.

The cabinet may be constructed from any veneer or hardwood material from ¼" to ½" thick. Only three holes need be drilled on the front panel. Two small hooks and eyes hold the hinged door at the back of the cabinet closed. Rubber head tacks or legs should be used to raise the bottom of the cabinet about half an inch to give the necessary ventilation, and allow space for the extension cord, an-

Is Built Into TABLE LAMP

by P. M. OHLINGER

tenna lead-in, and ground wire to run under.

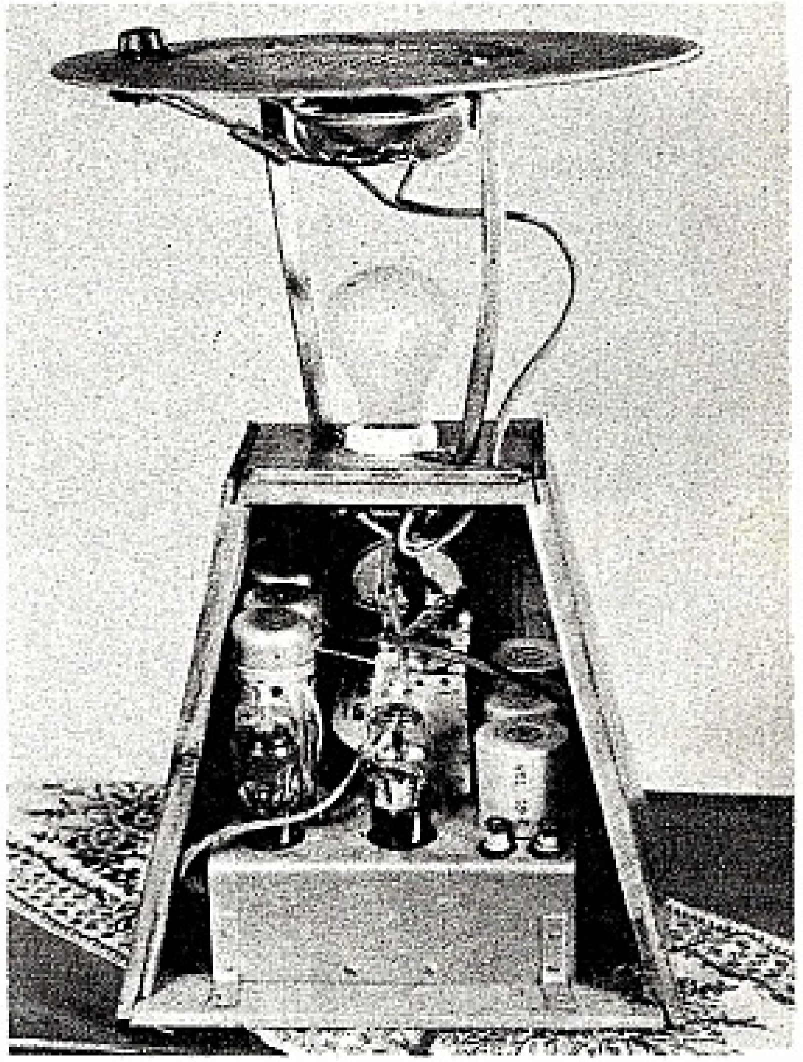
The electralloy chassis on which all parts are mounted slides out through the back of the set, once the two bolts which fasten it to the bottom board of the cabinet are removed, and the control dials on the front panel taken off. The face of the airplane dial fastens permanently to the cabinet, the dial sliding back with the chassis.

Connect all parts according to the circuit diagram, soldering every lead carefully and using rubber-covered, push-back type wire. By studying the diagram carefully and planning a bit before connecting in the smaller resistors and condensers, you will find that most of these can be mounted by their own leads, without using additional wire.

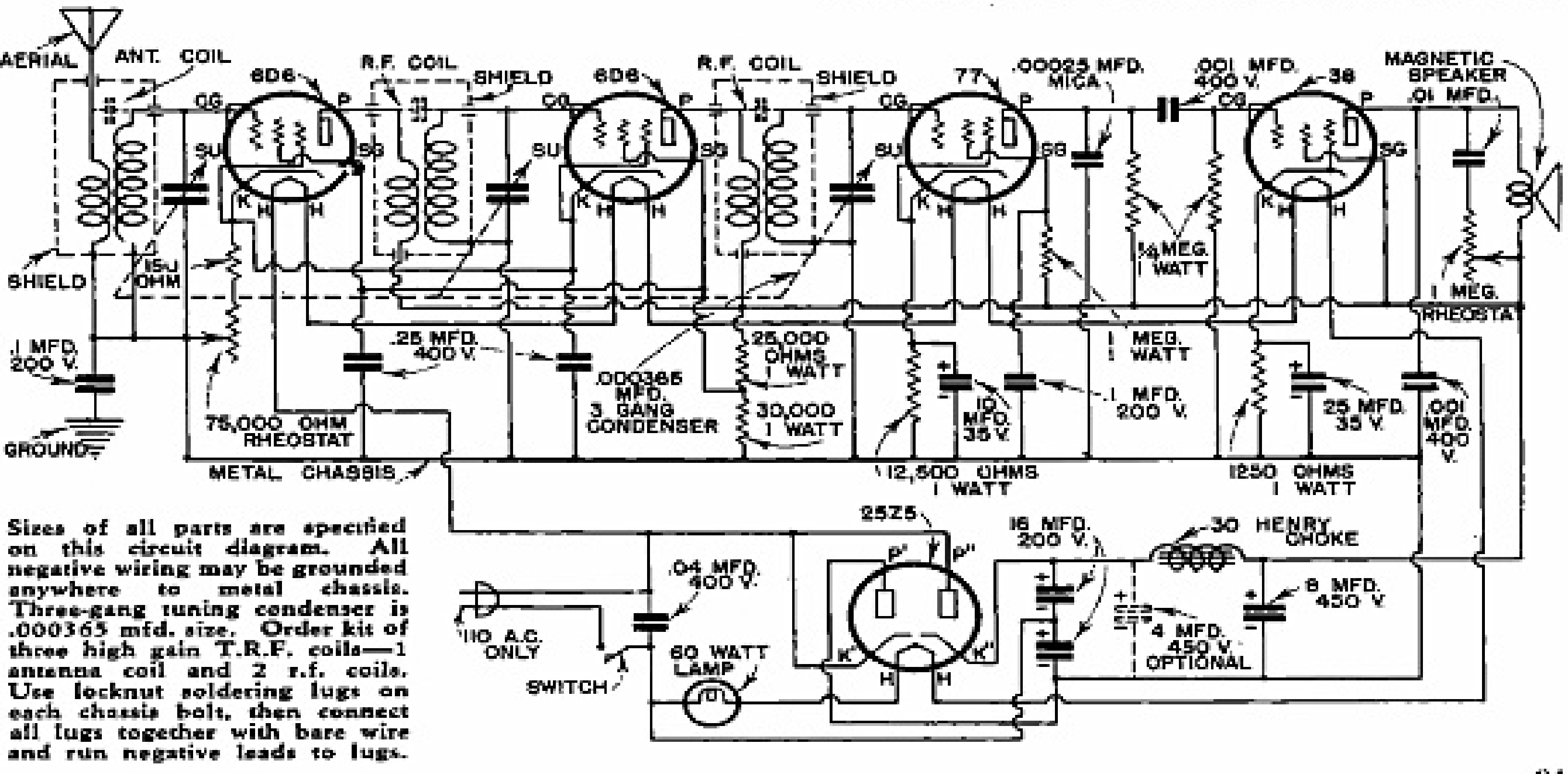
TABLE LAMP RADIO BLUEPRINTS

MM blue line prints, containing all diagrams enlarged many times, will simplify the construction of this radio set for you. Included with the plans is a complete list of parts needed. If you prefer to work from blueprints, send 50c for your plans to Modern Mechanix Pub. Co., Minneapolis, Minn.

FREE PARTS LIST—If you do not care to order the blueprints at this time, but need the parts list, send in a stamped addressed envelope with your request, and this detailed list will be sent free of charge.

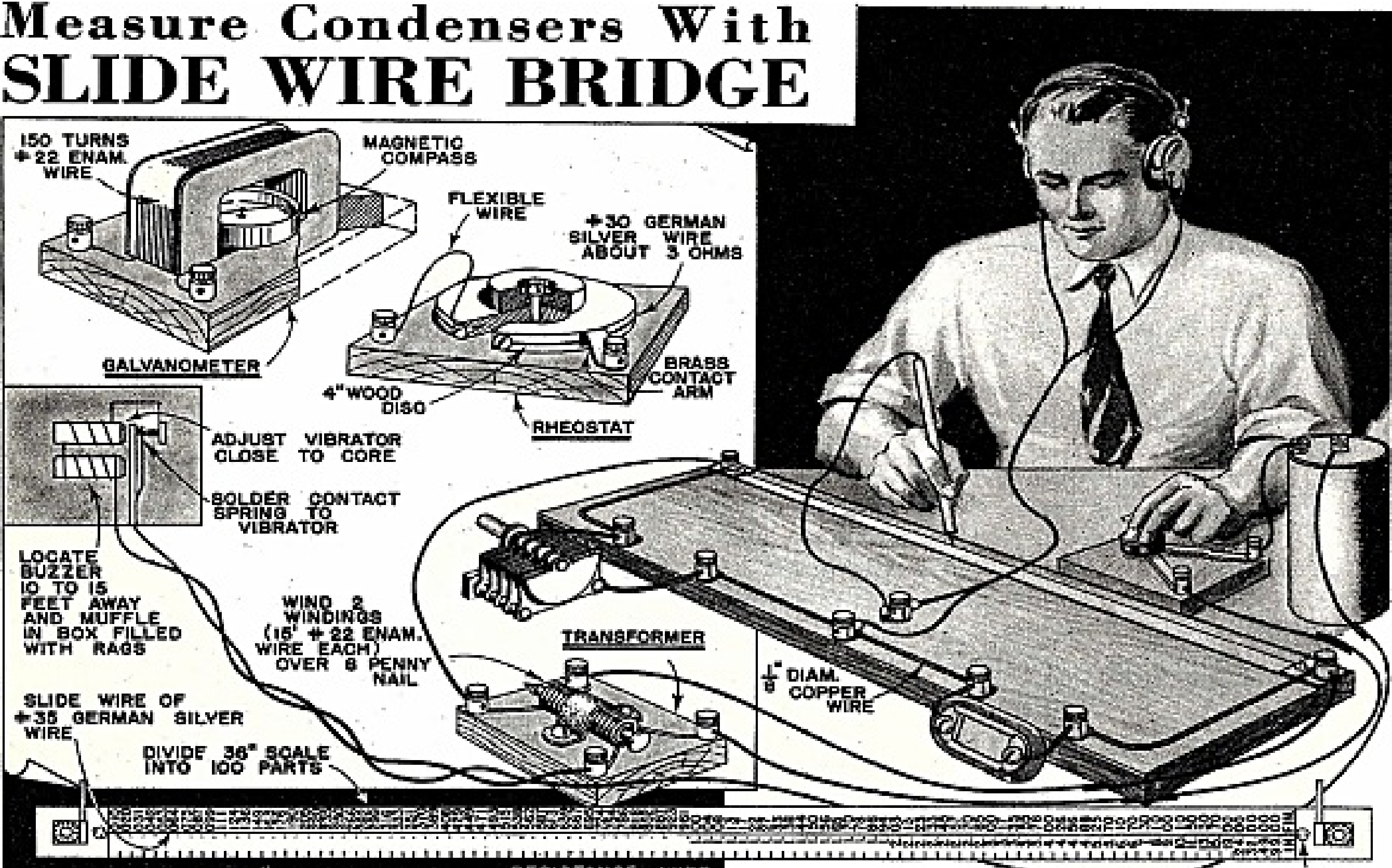


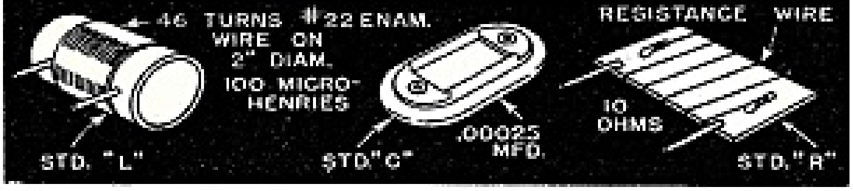
Back of cabinet, hinged at top, has been removed to show chassis and speaker. Two bolts hold the chassis in place.


AERIAL
ANT. COIL
6D6
CG
SU
SG
P
K
H
R.F. COIL
SHIELD
6D6
R.F. COIL
SHIELD
77
.00025 MFD. MICA
.001 MFD. 400 V.
38
MAGNETIC SPEAKER
.01 MFD.
SHIELD
150 OHM
.1 MFD. 200 V.
GROUND
75,000 OHM RHEOSTAT
.25 MFD. 400 V.
.000365 MFD. 3 GANG CONDENSER
25,000 OHMS 1 WATT
30,000 1 WATT
¼ MEG. 1 WATT
1 MEG. 1 WATT
10 MFD. 35 V.
.1 MFD. 200 V.
25 MFD. 35 V.
.001 MFD. 400 V.
1 MEG. RHEOSTAT
METAL CHASSIS
12,500 OHMS 1 WATT
1250 OHMS 1 WATT
25Z5
P'
P''
K'
K''
16 MFD. 200 V.
30 HENRY CHOKE
8 MFD. 450 V.
4 MFD. 450 V. OPTIONAL
.04 MFD. 400 V.
110 A.C. ONLY
SWITCH
60 WATT LAMP

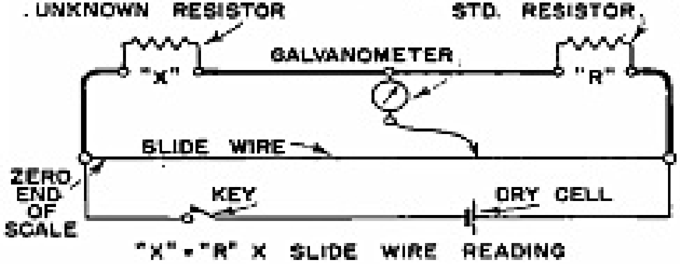
Sizes of all parts are specified on this circuit diagram. All negative wiring may be grounded anywhere to metal chassis. Three-gang tuning condenser is .000365 mfd. size. Order kit of three high gain T.R.F. coils—1 antenna coil and 2 r.f. coils. Use locknut soldering lugs on each chassis bolt, then connect all lugs together with bare wire and run negative leads to lugs.

Measure Condensers With SLIDE WIRE BRIDGE


150 TURNS #22 ENAM. WIRE
MAGNETIC COMPASS
FLEXIBLE WIRE
#30 GERMAN SILVER WIRE ABOUT 3 OHMS
GALVANOMETER
4" WOOD DISC
BRASS CONTACT ARM
RHEOSTAT
ADJUST VIBRATOR CLOSE TO CORE
SOLDER CONTACT SPRING TO VIBRATOR
LOCATE BUZZER 10 TO 15 FEET AWAY AND MUFFLE IN BOX FILLED WITH RAGS
WIND 2 WINDINGS (15' #22 ENAM. WIRE EACH) OVER 6 PENNY NAIL
TRANSFORMER
1/8" DIAM. COPPER WIRE
SLIDE WIRE OF #35 GERMAN SILVER WIRE
DIVIDE 36" SCALE INTO 100 PARTS
SOLDER TO BRASS PLATE


46 TURNS #22 ENAM. WIRE ON 2" DIAM. 100 MICRO-HENRIES
STD. "L"
.00025 MFD.
STD. "C"
RESISTANCE WIRE
10 OHMS
STD. "R"

Mark scale under slide wire as shown above. Each number gives ratio between lengths of wire to left and to right of point. Instructions for making galvanometer, rheostat, standard inductance, transformer, and buzzer for this simple slide wire Wheatstone Bridge are given above. Maximum capacity of variable condenser is measured as in the large sketch.


UNKNOWN RESISTOR
STD. RESISTOR
"X"
"R"
GALVANOMETER
SLIDE WIRE
ZERO END OF SCALE
KEY
DRY CELL
"X" = "R" X SLIDE WIRE READING

Measure resistances with above bridge-galvanometer circuit

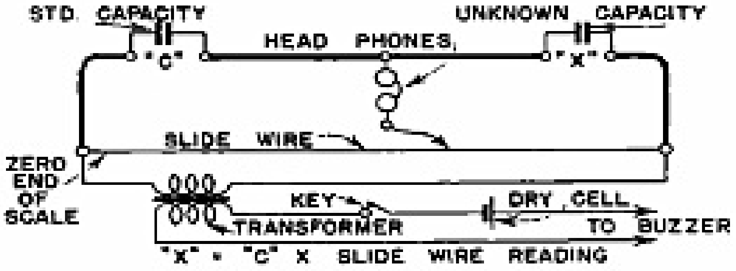
THE principle of the slide wire Wheatstone Bridge, familiar to electrical experimenters, is used here to measure small fixed and variable condensers and inductances, as well as resistances.

The slide wire should not be larger than No. 35 manganin or German silver wire, obtainable from scientific supply houses. It is soldered to brass plates bent over the ends of the wood scale.

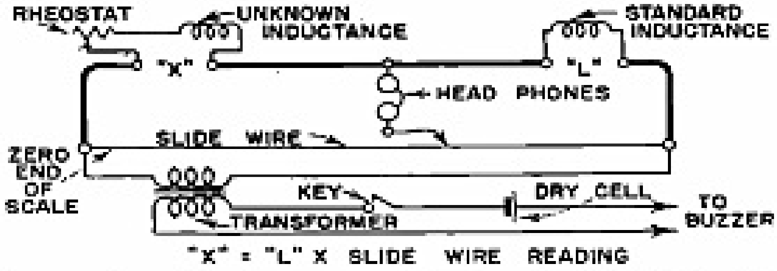
Homemade resistance and inductance standards will prove sufficiently accurate if carefuly made. Wind 10, 100, and 1,000 ohm resistance standards on bakelite or fiber, using measured lengths of nichrome or very small copper wire.

To measure an unknown resistance, connect parts as shown in the diagram, turning the

[*Continued on page 142*]


STD. CAPACITY
UNKNOWN CAPACITY
"C"
"X"
HEAD PHONES
SLIDE WIRE
ZERO END OF SCALE
KEY
DRY CELL
TRANSFORMER
TO BUZZER
"X" = "C" X SLIDE WIRE READING

This circuit gives the sizes of fixed and variable condensers.

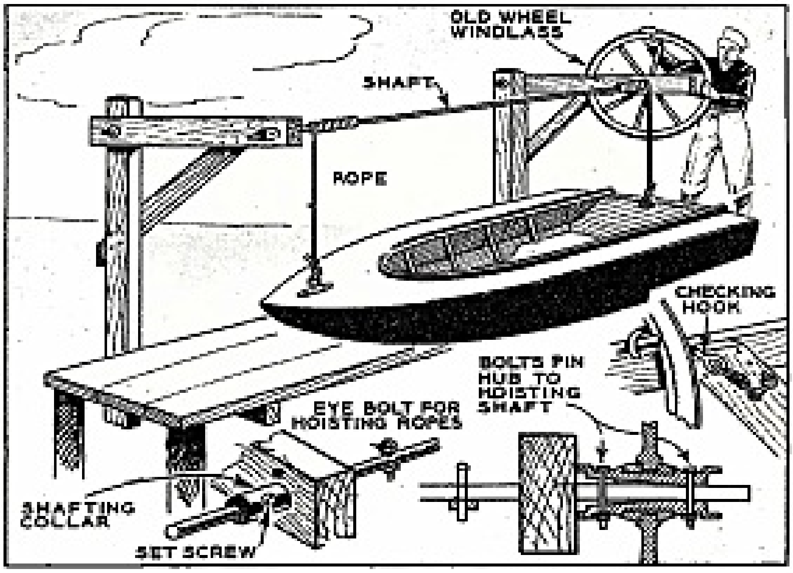

RHEOSTAT
UNKNOWN INDUCTANCE
STANDARD INDUCTANCE
"X"
"L"
HEAD PHONES
SLIDE WIRE
ZERO END OF SCALE
KEY
DRY CELL
TRANSFORMER
TO BUZZER
"X" = "L" X SLIDE WIRE READING

Measure sizes of inductances and choke coils with this circuit.

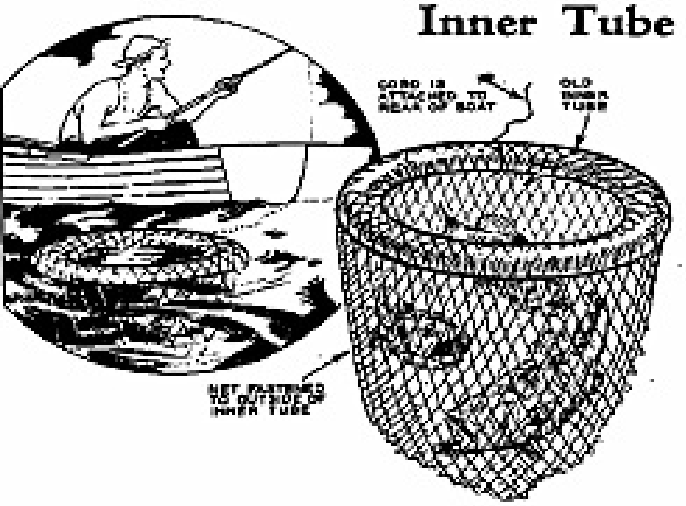
Boating and Fishing Kinks

One Man Can Operate Boat Hoist

MADE of common materials and mounted in a boat house or on a wharf, this hoist is ideal for handling row boats and small motor boats. When raising the boat, either for storage or repair work, eye bolts fastened to the boat or rope slings may be used. The windlass consists of a carriage wheel fastened either to a solid shaft or a strong pipe. As the wheel is turned, the hoisting rope winds about the shaft, and when the desired height is reached, the wheel is made fast with a checking hook. One man can thus handle a large sized boat.—D. W. Prince, Bridgewater, Nova Scotia.


OLD WHEEL WINDLASS
SHAFT
ROPE
CHECKING HOOK
BOLTS PIN HUB TO HOISTING SHAFT
EYE BOLT FOR HOISTING ROPES
SHAFTING COLLAR
SET SCREW

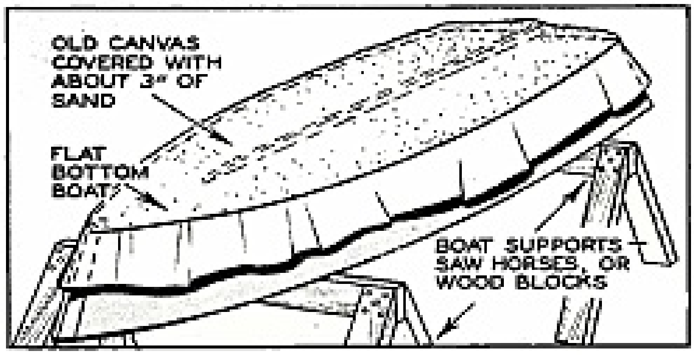
Inner Tube Forms Float for Fisherman's Live Box

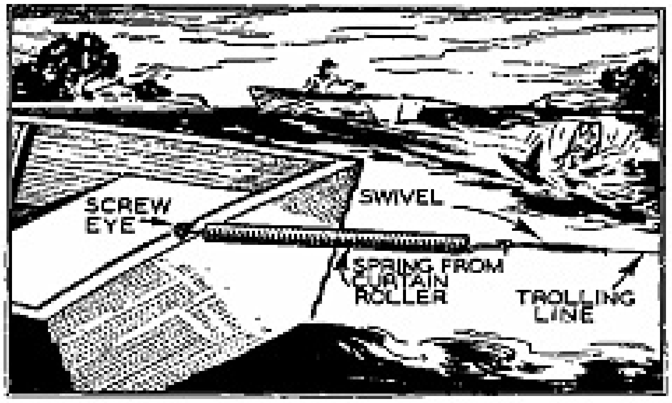

CORD IS ATTACHED TO REAR OF BOAT
OLD INNER TUBE
NET FASTENED TO OUTSIDE OF INNER TUBE

AN OLD inner tube is all that is needed to provide the float for this fish retainer. Any suitable piece of netting such as an old fish net, or even a tennis net if the mesh is fine enough, can be tied together to form a large basket. Then all that is necessary to do is make the net fast about the inner tube, being sure that there are no holes left at the top. This retainer will keep fish alive indefinitely, and when not in use, can be compactly folded.—Robert Poulson, Hutchinson, Minn.

Sand Prevents Boat's Drying and Warping

IF IT is not convenient to store your boat inside during the winter, haul it well above the high water mark and turn it over, resting the bow and stern on planks. Then cover the bottom with a sheet of old canvas and shovel on about three inches of sand in the manner shown on right. This prevents the sun from drying and warping the wood. Rain water drains off the sand in a short time, and frost will not injure the boat.—Hi Sibley, Pasadena, California.

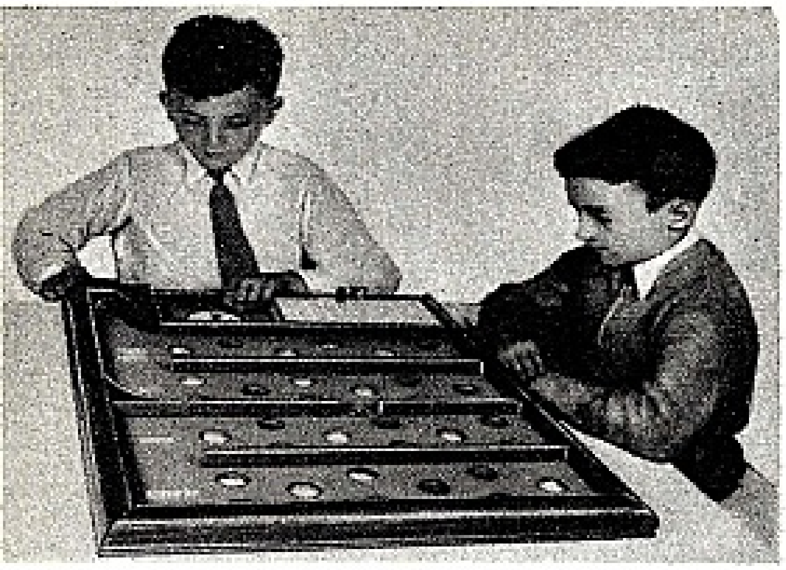

OLD CANVAS COVERED WITH ABOUT 3" OF SAND
FLAT BOTTOM BOAT
BOAT SUPPORTS—SAW HORSES, OR WOOD BLOCKS


SCREW EYE
SWIVEL
SPRING FROM CURTAIN ROLLER
TROLLING LINE

Trolling Hitch Is Made from Coil Spring

THIS non-slack trolling line can be fashioned from any coil spring such as the spring from the inside of a curtain roller. The trolling line is fastened to the end of the spring. When a fish strikes, the spring breaks the shock of the tug, and keeps a steady pull on the hook. By fastening the line to the spring with a slipknot, a jerk will release it when the fish is caught, and he can be played as usual.—Jennings Berge, Minneapolis, Minnesota.

Football Game Gives All-American Thrills



Young and old alike will find enjoyment in this simple but ingenious marble-football game. Move play block to one of four positions to select play. Construction details are below.

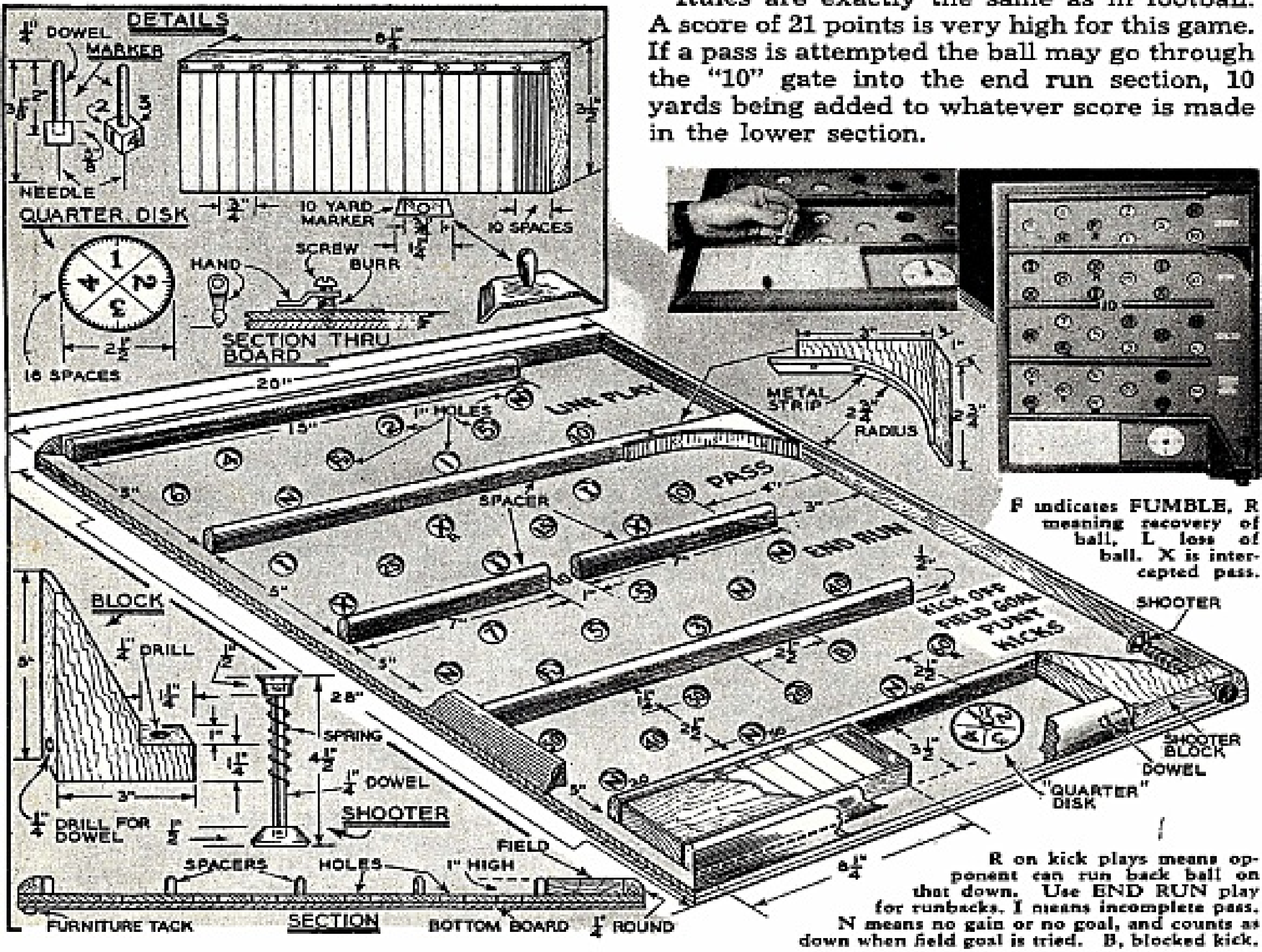
by RALPH T. MOORE

NEITHER difficult in construction nor complicated in play is this all-American football game, combining the thrills of football with the lure of the now-popular marble games.

When a play is called, the *play block* is moved to guide the ball into the section provided for that particular play. A ¾" diameter marble, shot out by a dowel pin and spring device, drops into one of the play board holes.

A pointer on the *quarter* disc is moved one space for each play, sixteen plays constituting a quarter. The *location* of the ball and the *down* after each play is recorded by a single marker on the miniature playing field. Divide the field into 100 spaces with inked lines, marking every tenth line, then paste the cardboard down on the board.

Rules are exactly the same as in football. A score of 21 points is very high for this game. If a pass is attempted the ball may go through the "10" gate into the end run section, 10 yards being added to whatever score is made in the lower section.


DETAILS
¼" DOWEL
MARKER
NEEDLE
QUARTER DISK
16 SPACES
2½"
10 YARD MARKER
10 SPACES
SCREW
BURR
HAND
SECTION THRU BOARD
20"
15"
1" HOLES
LINE PLAY
PASS
END RUN
KICK OFF
FIELD GOAL
PUNT
KICKS
SPACER
METAL STRIP
2¾" RADIUS
BLOCK
¼" DRILL
¼" DRILL FOR DOWEL
SPRING
¼" DOWEL
SHOOTER
SPACERS
HOLES
FIELD
1" HIGH
FURNITURE TACK
SECTION
BOTTOM BOARD
¼" ROUND
SHOOTER BLOCK
DOWEL
"QUARTER" DISK
8¼"

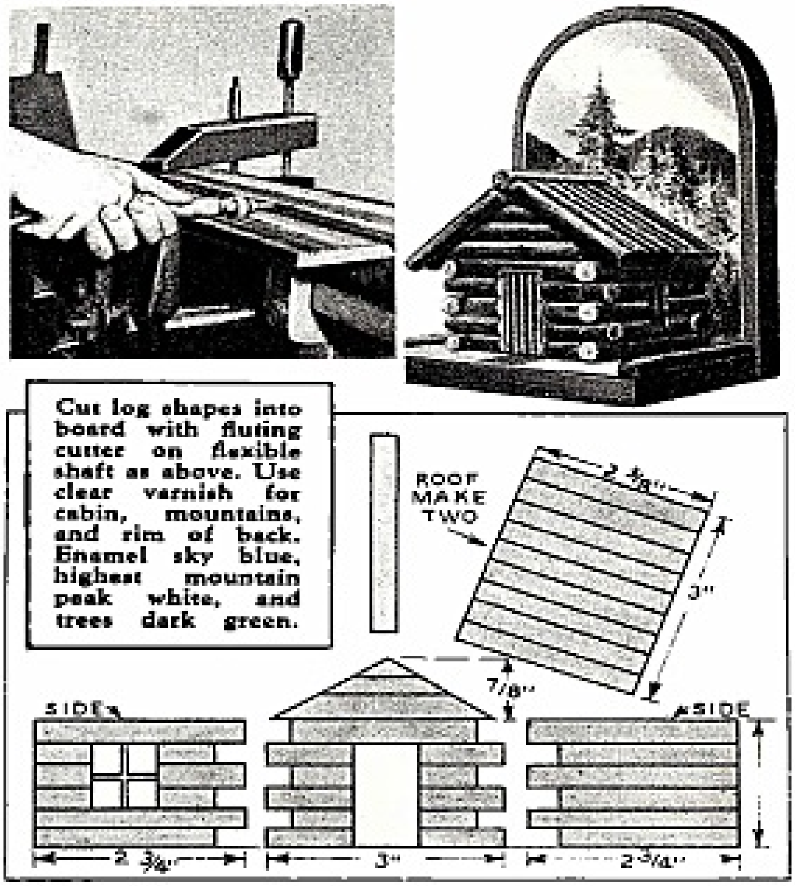
F indicates FUMBLE, R meaning recovery of ball, L loss of ball. X is intercepted pass.

R on kick plays means opponent can run back ball on that down. Use END RUN play for runbacks. I means incomplete pass. N means no gain or no goal, and counts as down when field goal is tried. B, blocked kick.

Carve "Cabin-In-the-Pine" Book Ends With Drill Press

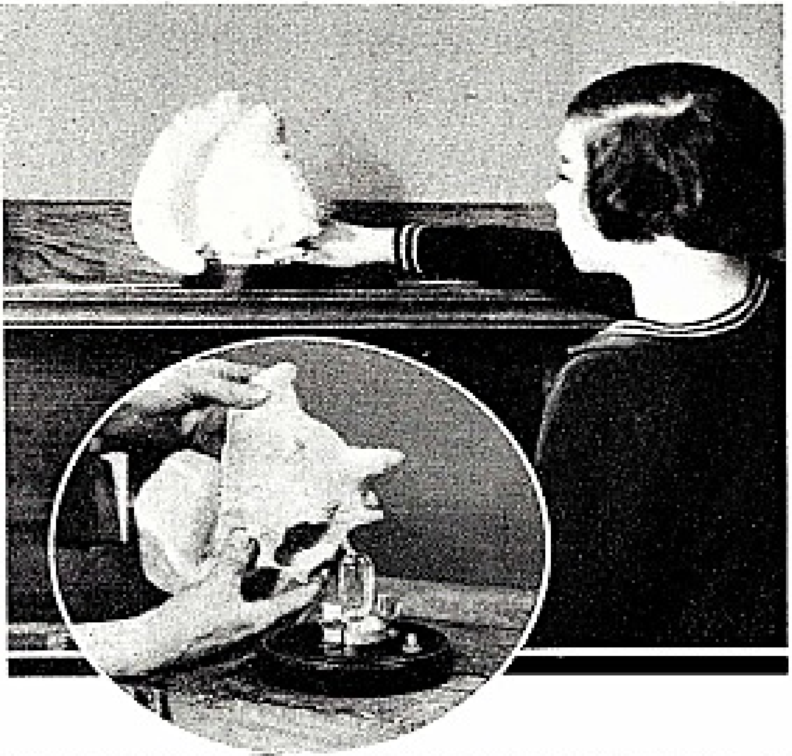
ALTHOUGH these attractive log cabin bookends can be made by hand with chisel and sandpaper, much better results are obtained by forming the log sides and roof with carving and routing bits on the drill press, or with a fluting cutter on a flexible shaft. Cut all of the logs at once from a piece of 3/8" pine stock, then saw to the specified sizes, notching the ends to provide for interlocking.

Cut the back piece to shape, on the band saw, then draw in a mountainside scene. With routing bits cut back the sky the deepest, the mountains a little shallower. Leave the trees on the surface of the board, cutting the foliage pattern into the surface. The rim around the outside forms a frame for the scene if left at its original thickness.



Cut log shapes into board with fluting cutter on flexible shaft as above. Use clear varnish for cabin, mountains, and rim of back. Enamel sky blue, highest mountain peak white, and trees dark green.

Fit Lamp Bulbs Into Conch Shells



Light from within brings out the beauty of a conch shell. If shell is not smooth at bottom, support on base by brass strips bent as shown. All wiring to switch and socket is concealed.

LARGE pink conch shells can be converted into really beautiful electric mantel lamps. Lighting from within brings out the gorgeous rose colors.

Grind off the opening of the shell to form a smooth surface that will fit on a turned hardwood base. Drill holes for the fixture switch and for a small size socket for the 15-watt candelabra or tubular bulb. Center the shell over the bulb with three brackets or hanger-like supports.

Place New Design On Old Linoleum

LINOLEUM with the surface design worn or faded but with a sound foundation may be refinished in a few hours to give a pleasing, durable, and easily cleaned surface adding years of service to your linoleum floor.

After cleaning the linoleum, apply a flat finish of a good floor enamel, and allow it to dry. Now place a quantity of floor enamel of a contrasting color on a plate, piece of tin, or pane of glass. Moisten a fine-grained sponge just enough to soften it, then transfer the paint from the plate to the floor with a dabbing motion, to produce a beautifully mottled effect. By combining sliding and dabbing motions with varying pressures, a wide variety of designs can be produced. A coating of floor wax gives the rug a new appearance.

The worn linoleum (visible at right above) is covered with flat finish paint, then stippled with a sponge as shown to give a pleasing design of contrasting colors.

"Tiny Tom"—

You can be dispatcher of a complete table top railroad. Here are detailed plans for building an 00 gauge locomotive and tender at a cost of $5.00.

by EARL DUVAL

PART I

MODEL railroading is a hobby that has an unparalleled appeal to young and old alike. It is a hobby that offers free flight of imagination to those that enjoy the clamor of freight trains in a busy metropolitan switching yard and get a thrill out of the passenger trains that speed through the night.

Model railroading packs all those thrills into your own home. You can have a complete railroad system of your own at any price from five dollars to thousands of dollars. The model railroad is not a toy. It is a serious hobby in which actual scale models only are considered.

The systems vary in scale from the tiny HO gauge so popular in England to larger live steam outdoor models. One of the handiest scales to squeeze into a limited space is the 4 millimetre to the foot scale, better known as OO gauge.

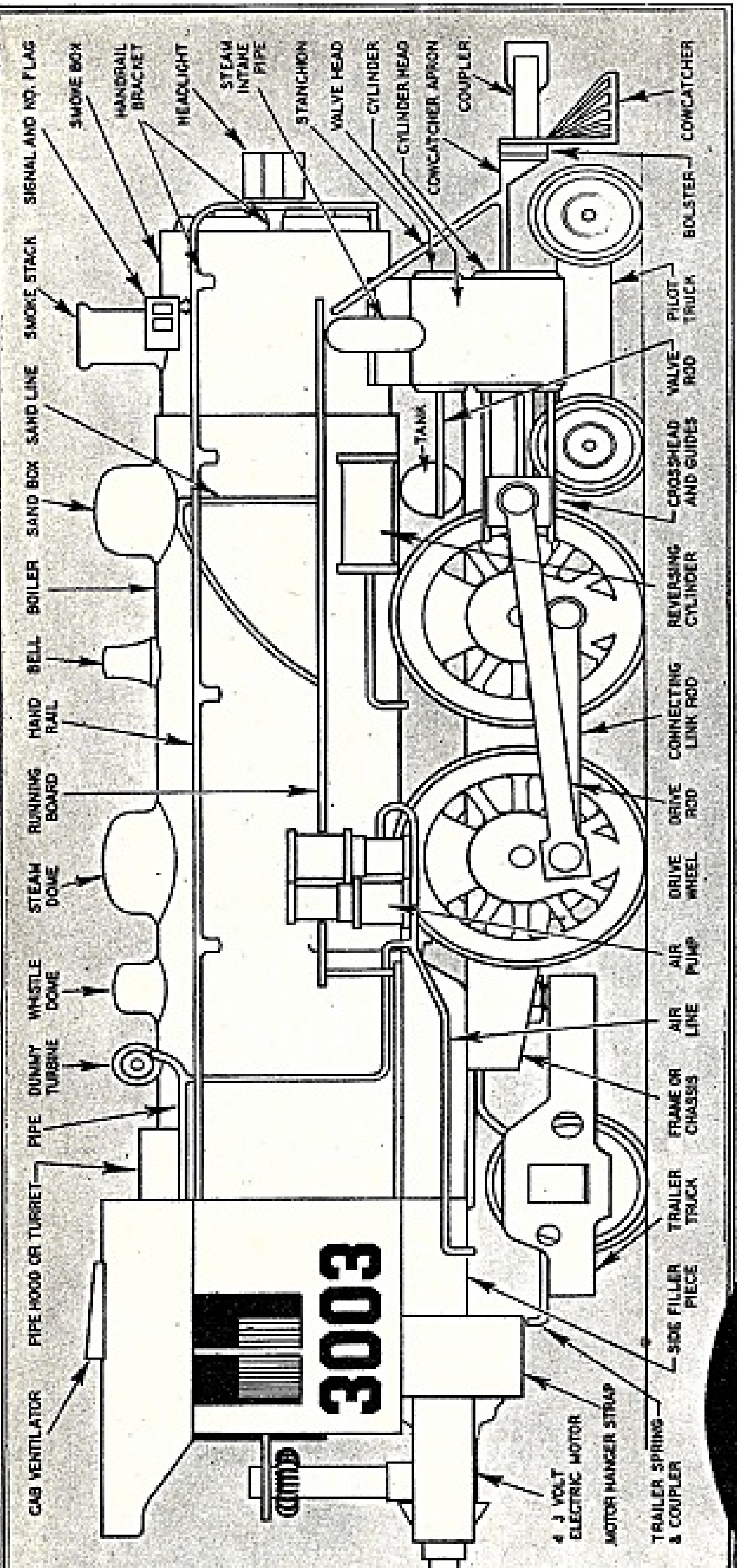
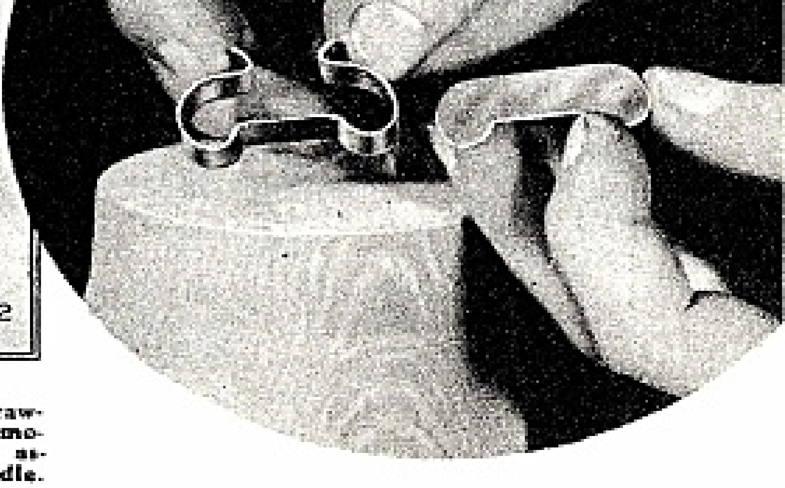

SIGNAL AND NO. FLAG
SMOKE BOX
HANDRAIL BRACKET
HEADLIGHT
STEAM INTAKE PIPE
STANCHION
VALVE HEAD
CYLINDER
CYLINDER HEAD
COWCATCHER APRON
COUPLER
COWCATCHER
BOLSTER
PILOT TRUCK
VALVE ROD
CROSSHEAD AND GUIDES
REVERSING CYLINDER
CONNECTING LINK ROD
DRIVE ROD
DRIVE WHEEL
AIR PUMP
AIR LINE
FRAME OR CHASSIS
TRAILER TRUCK
SIDE FILLER PIECE
TRAILER SPRING & COUPLER
MOTOR HANGER STRAP
4.5 VOLT ELECTRIC MOTOR
TANK
SMOKE STACK
SAND LINE
SAND BOX
BOILER
BELL
HAND RAIL
RUNNING BOARD
STEAM DOME
WHISTLE DOME
DUMMY TURBINE
PIPE
PIPE HOOD OR TURRET
CAB VENTILATOR
3003

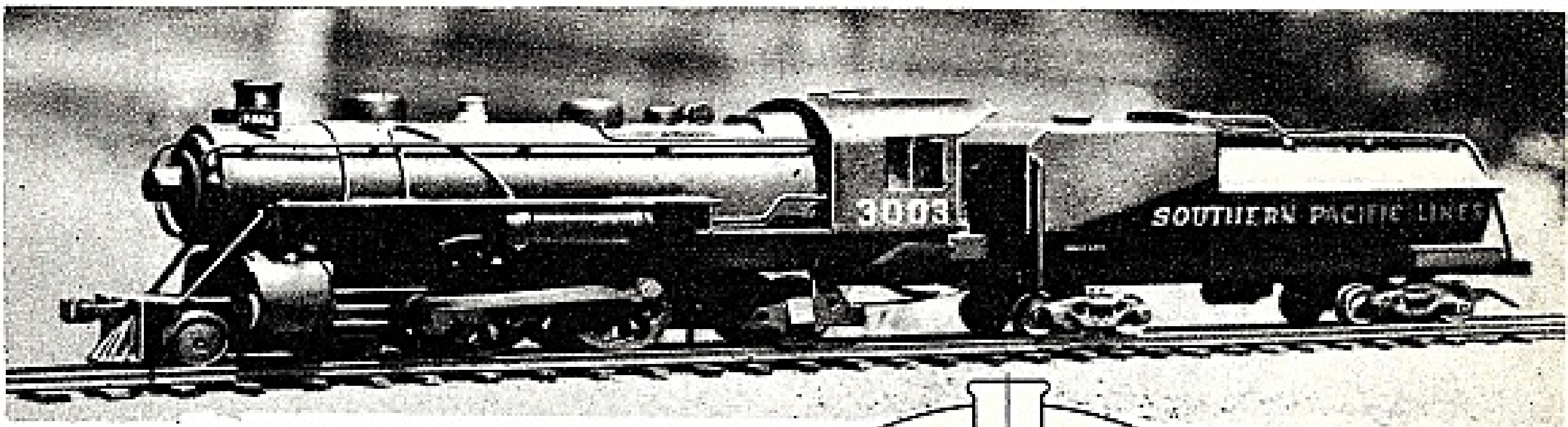
FIG. 1 ACTUAL SIZE SIDE VIEW OF THE ASSEMBLED LOCOMOTIVE

"OO" GAUGE ATLANTIC TYPE 4-4-2



Get an idea of the small size of "Tiny Tom" from the actual size drawing above. Use Fig. 1 to identify and scale off parts of the locomotive mentioned in text. Right—How the cylinder saddle is assembled. Brass strap is soldered to two end pieces to form saddle.

A Pencil-Length Locomotive



Here is "Tiny Tom," the completed 00 gauge locomotive and tender. Every essential detail of its full size Southern Pacific prototype is reproduced in this 4 mm. scale model.

An OO gauge track measures ¾" between the rails. The average OO gauge passenger locomotive is about seven inches long, about the length of a lead pencil, and 2¼ inches high. Box cars are about six inches long. With OO gauge it is possible to build an entire railroad system on top of a table, hence the term "table top railway."

"Tiny Tom," the OO gauge locomotive about to be described, can be built in a week of spare time at a cost of approximately five dollars. It is an Atlantic 4-4-2 type of passenger and fast freight locomotive used by the Southern Pacific railroad between Oakland, San Francisco, and Bakersfield.

The plans show an exact scale reduction to 4 mm. per foot with such detail of the full-sized locomotive as will look well and work well on the model. An actual idea of its size can be obtained by turning to Fig. 1 which is a full size drawing of the completed locomotive.

Begin by cutting out the,boiler according to

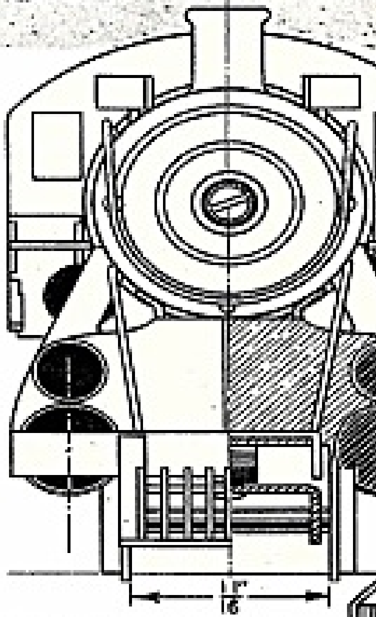


FIG. 2 - FRONT VIEW & PARTIAL SECTION

Figs. 2 and 3 are full size views. Shaded portion of Fig. 2 shows undercarriage construction. Heads of common pins, cut off short, are excellent for detail on the smoke box front. Use Fig. 5 as pattern for cutting cylinder saddle and plates from 22 gauge brass. Get width of strap from Fig. 1. A nail soldered to bottom end of saddle is driven through wooden smoke box. Line up saddle before nailing to smoke box.

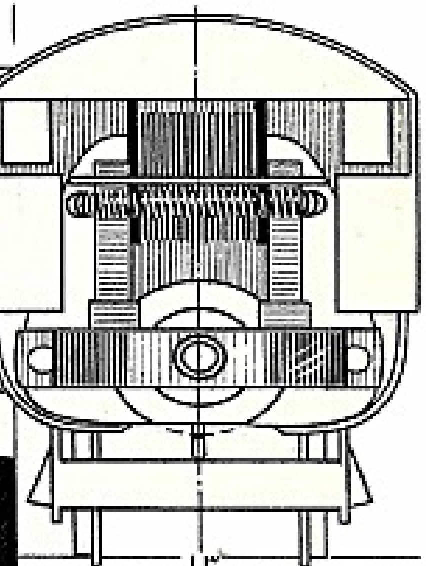
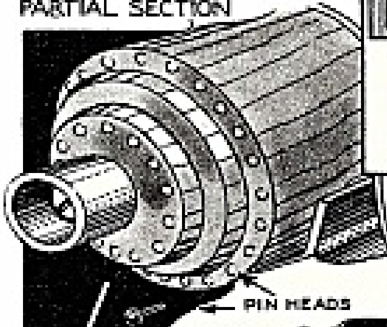


FIG. 3 — REAR VIEW OF CAB



DETAIL OF SMOKE BOX END

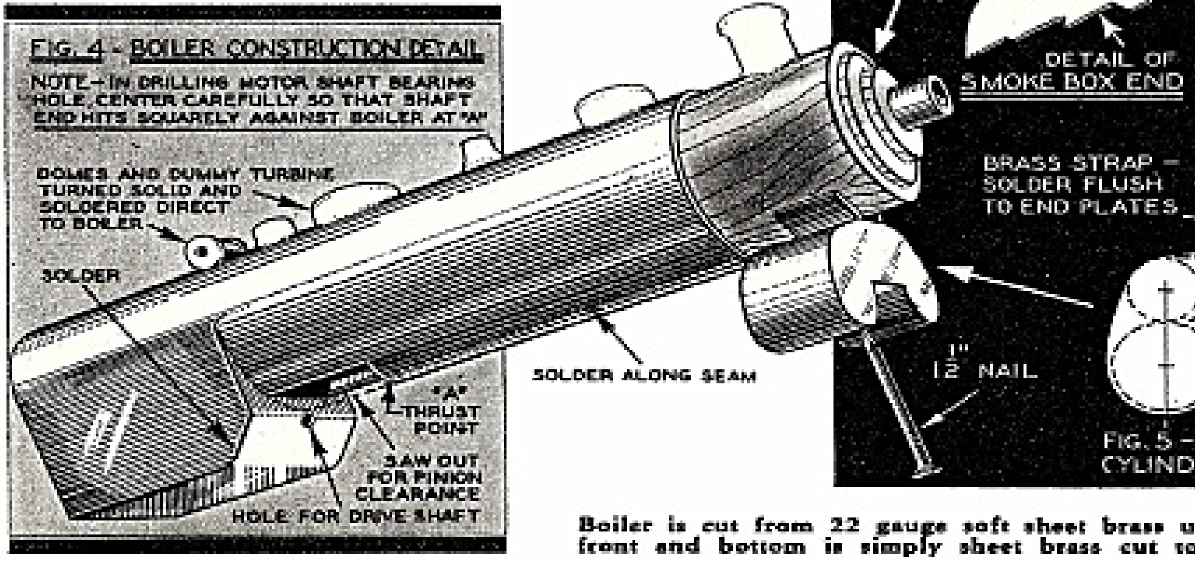

NOTE—IN DRILLING MOTOR SHAFT BEARING HOLE, CENTER CAREFULLY SO THAT SHAFT END HITS SQUARELY AGAINST BOILER AT "A"
DOMES AND DUMMY TURBINE TURNED SOLID AND SOLDERED DIRECT TO BOILER
SOLDER
SOLDER ALONG SEAM
"A" THRUST POINT
SAW OUT FOR PINION CLEARANCE
HOLE FOR DRIVE SHAFT
1½" NAIL

FIG. 4 - BOILER CONSTRUCTION DETAIL

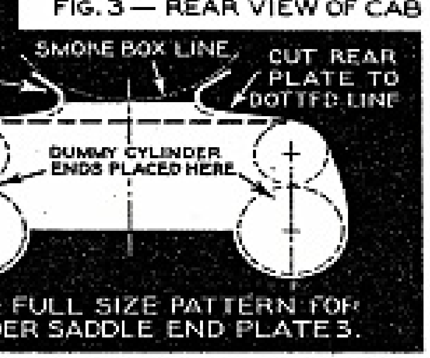

BRASS STRAP — SOLDER FLUSH TO END PLATES
SMOKE BOX LINE
CUT REAR PLATE TO DOTTED LINE
DUMMY CYLINDER ENDS PLACED HERE

FIG. 5 - FULL SIZE PATTERN FOR CYLINDER SADDLE END PLATE 3.

Boiler is cut from 22 gauge soft sheet brass using Fig. 7 as pattern. Firebox front and bottom is simply sheet brass cut to fit and soldered flush to box.

Full-Size Patterns Simplify LOCOMOTIVE CONSTRUCTION

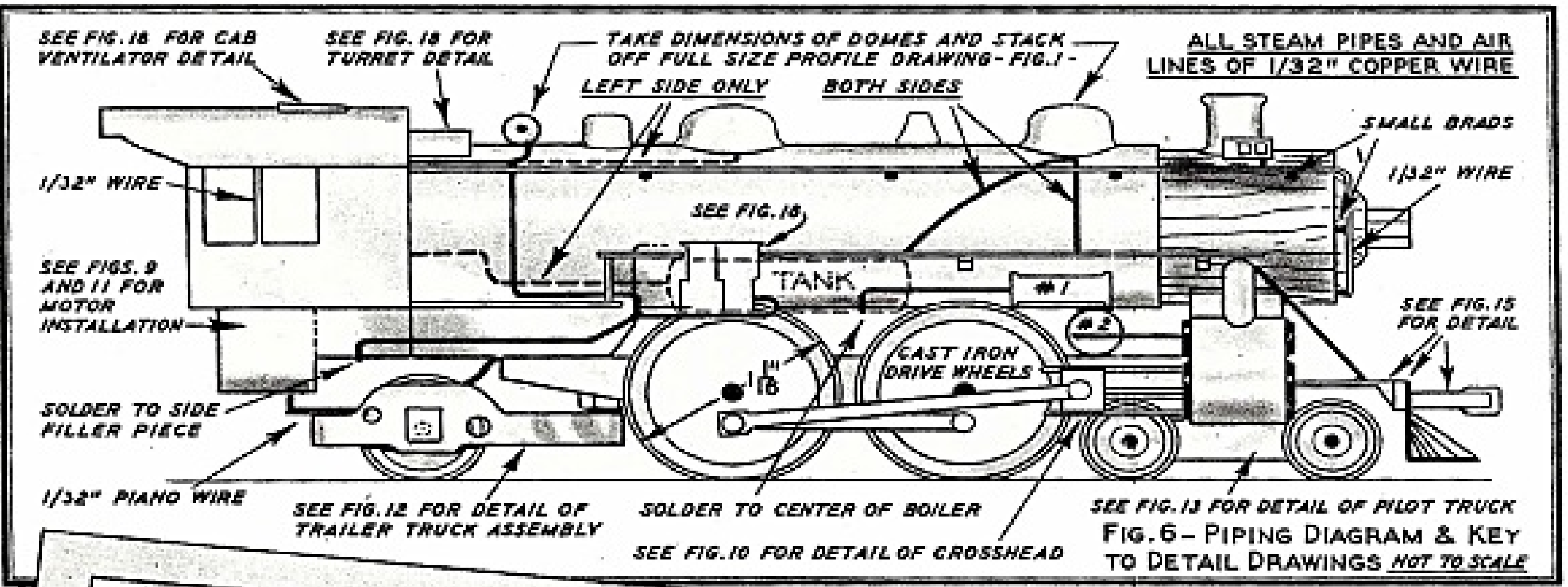

SEE FIG. 16 FOR CAB VENTILATOR DETAIL
SEE FIG. 18 FOR TURRET DETAIL
TAKE DIMENSIONS OF DOMES AND STACK OFF FULL SIZE PROFILE DRAWING - FIG. 1 -
LEFT SIDE ONLY
BOTH SIDES
ALL STEAM PIPES AND AIR LINES OF 1/32" COPPER WIRE
SMALL BRADS
1/32" WIRE
1/32" WIRE
SEE FIG. 16
SEE FIGS. 9 AND 11 FOR MOTOR INSTALLATION
TANK
#1
#2
1 1/16"
CAST IRON DRIVE WHEELS
SEE FIG. 15 FOR DETAIL
SOLDER TO SIDE FILLER PIECE
1/32" PIANO WIRE
SEE FIG. 12 FOR DETAIL OF TRAILER TRUCK ASSEMBLY
SOLDER TO CENTER OF BOILER
SEE FIG. 10 FOR DETAIL OF CROSSHEAD
SEE FIG. 13 FOR DETAIL OF PILOT TRUCK

FIG. 6 – PIPING DIAGRAM & KEY TO DETAIL DRAWINGS *NOT TO SCALE*

Fig. 6 will be used as key to detail drawings in this and Part II. Dotted lines show detail on opposite side of boiler.

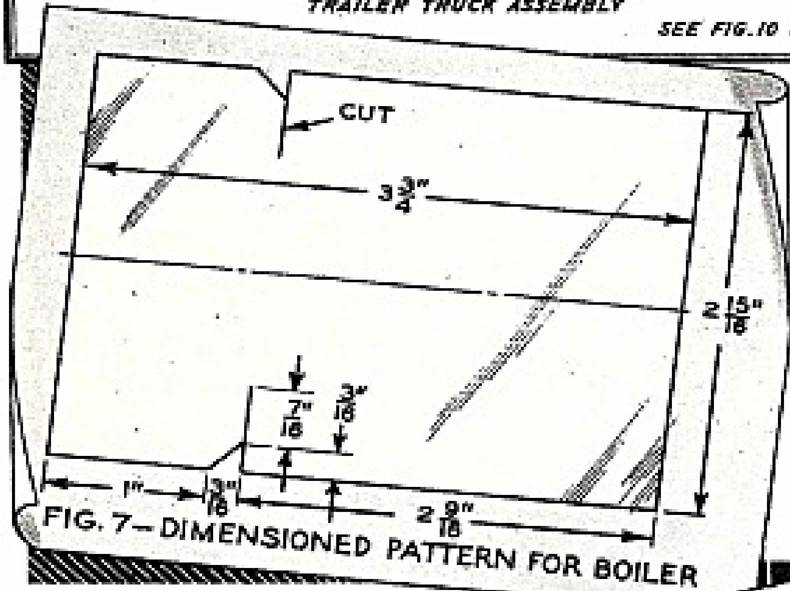

CUT
3 3/4"
2 15/16"
7/16"
3/16"
1"
3/16"
2 9/16"

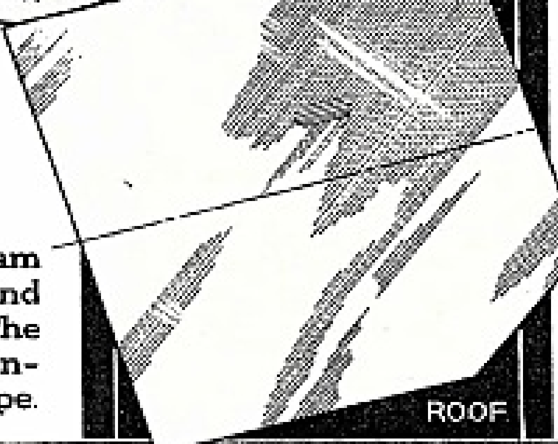
FIG. 7—DIMENSIONED PATTERN FOR BOILER

Fig. 7. Put a short length of broom stick or shafting in a vise and bend the boiler evenly about it until the seam edges come together. Then solder.

With the edges of the boiler seam soldered, cut out the firebox front end and the bottom, soldering them on. The dummy smokebox (Fig. 4) is next inserted and fastened with airplane dope.

Next the brass turnings which represent dummy turbine, whistle, steam dome, sand dome, bell, stack, and headlight are made on the lathe. Dimensions can be obtained from the full size drawing, Fig. 1. The stack and headlight are screwed in. The others are soldered on. Any excess solder on these and other connections are filed or scraped smooth.

The cylinder saddle is just a brass strap with two end plates soldered in. Fig. 5 shows a full size template for the end pieces. The little brass turnings representing the valve and cylinder ends are soldered in place taking care to align them so they look centered and true. This must be done after the saddle is fastened on to the boiler.



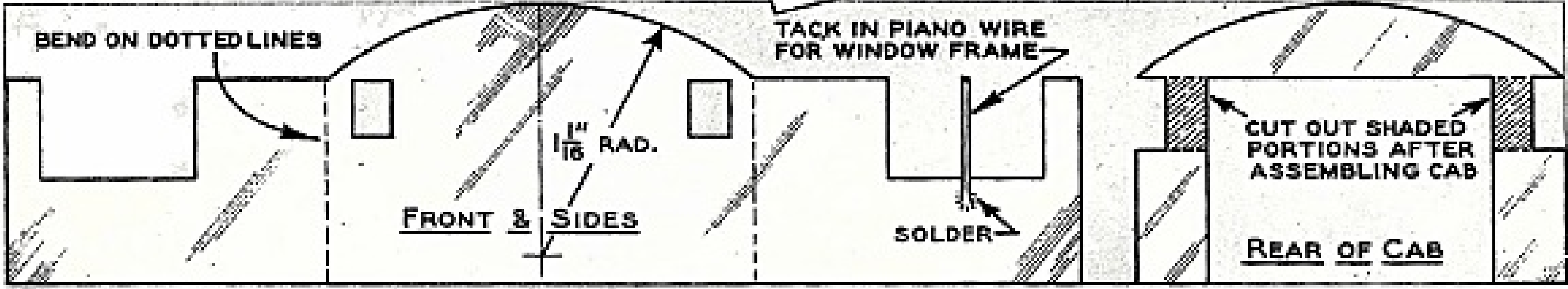

BEND ON DOTTED LINES
1 1/16" RAD.
FRONT & SIDES
TACK IN PIANO WIRE FOR WINDOW FRAME
SOLDER
CUT OUT SHADED PORTIONS AFTER ASSEMBLING CAB
REAR OF CAB

FIG. 8 COMPLETE FULL-SIZE PATTERNS FOR CAB—CUT TEMPLATE TO OUTSIDE OF LINES.

Use drawings above as full size pattern for cutting cab from 22 gauge brass. Roof is soldered on last. Shaded portions in rear are cut out to make room for electric motor.

Cross-Section SHOWS DRIVE DETAIL of "TINY TOM"

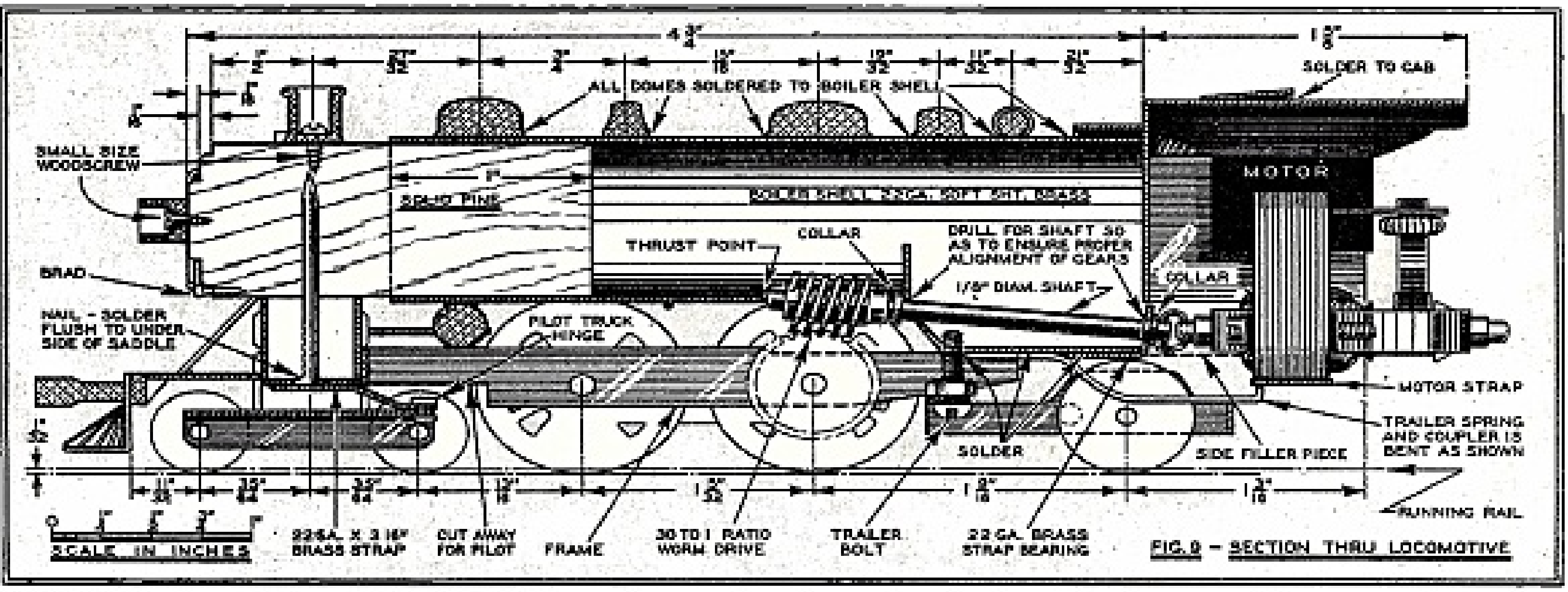

4 3/4"
1/2"
27/32"
3/4"
15/16"
19/32"
11/32"
21/32"
1 5/8"
5/16"
1/16"
SOLDER TO CAB
ALL DOMES SOLDERED TO BOILER SHELL
SMALL SIZE WOODSCREW
1"
SOLID PINE
BOILER SHELL 22GA. SOFT SHT. BRASS
MOTOR
THRUST POINT
COLLAR
DRILL FOR SHAFT SO AS TO ENSURE PROPER ALIGNMENT OF GEARS
1/8" DIAM. SHAFT
COLLAR
BRAD
NAIL - SOLDER FLUSH TO UNDER SIDE OF SADDLE
PILOT TRUCK HINGE
MOTOR STRAP
TRAILER SPRING AND COUPLER IS BENT AS SHOWN
SOLDER
SIDE FILLER PIECE
1/32"
1/8"
11/32"
35/64"
35/64"
13/16"
1 5/32"
1 9/16"
1 3/16"
RUNNING RAIL
0
1"
2"
3"
4"
SCALE IN INCHES
22GA. X 3/16" BRASS STRAP
CUT AWAY FOR PILOT
FRAME
30 TO 1 RATIO WORM DRIVE
TRAILER BOLT
22 GA. BRASS STRAP BEARING

FIG. 9 – SECTION THRU LOCOMOTIVE

Above is a cross section of "Tiny Tom" drawn to accurate scale and partly dimensioned to cover important points. Gear and drive shaft assembly are shown clearly. Motor installation, trucks, and pilot construction will be covered in Part II.

The cab must be cut out according to templates in Fig. 8 and soldered to the boiler. Do not cut out the shaded portions on the rear until cab is in place and squared up.

The frame or chassis, Fig. 10, is a 22 gauge brass strap bent and soldered in place. Bend and square up the frame to shape and before soldering drill the holes for the driver axles on a drill press using a block of hardwood between the sides to prevent bending and to get the axle holes true. The cutting of the angle at the rear of the frame and the front cutaway for the pilot wheels must be done after the frame is soldered in.

The worm gear that drives the locomotive must be prepared to fit the axle of the drivers. The worm is a 30 to 1 ratio and is a standard product. The driving pinion is $\frac{3}{16}$" diameter and has a hole for a ⅛" shaft. This is fine, and will go right on the motor drive shaft. But the driven worm, of brass, ⅝" diameter, has a boss and a $\frac{3}{16}$" hole. The boss must be cut off, and a bushing inserted to reduce the size of the shaft hole to the ⅛" size of the brass rod used for axles.

A hole is cut in the slant face of the firebox, centered so the shaft center hits the belly of the boiler as shown in Fig. 9. A hole is also cut into the boiler to give clearance to the gear and a thrust point for the shaft. A strap bearing is soldered at the rear of the cab with

[*Continued on page 126*]

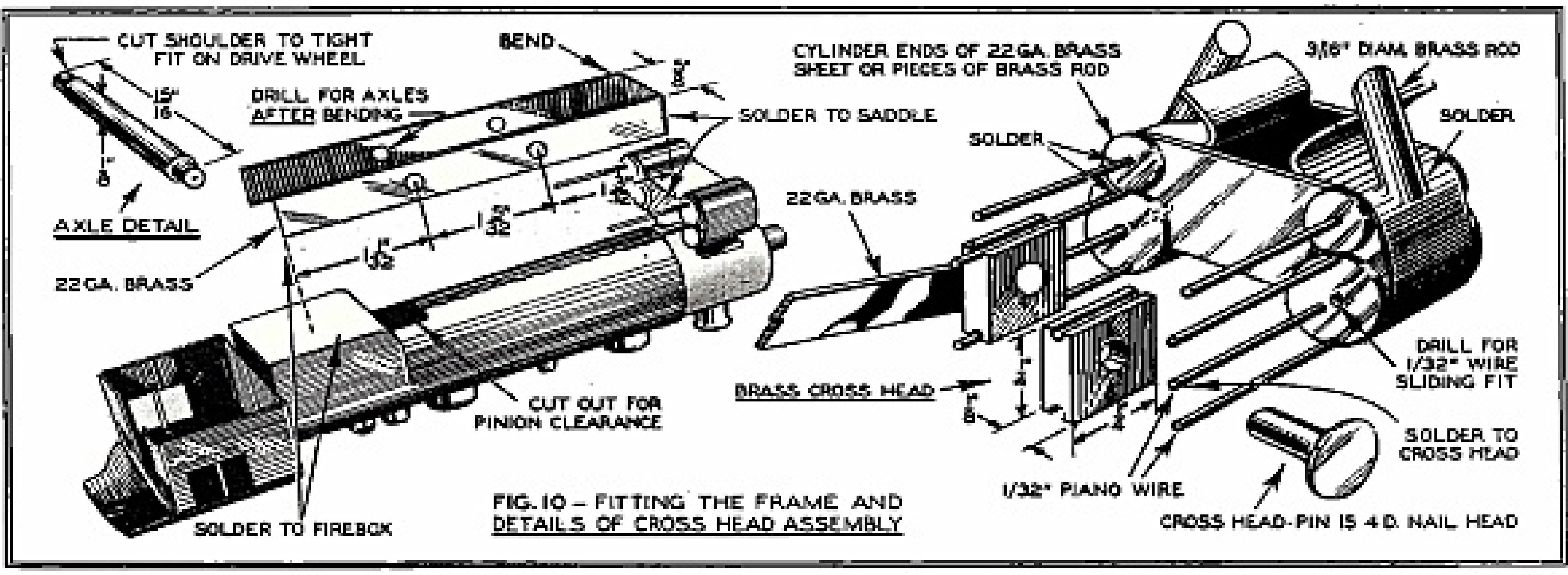
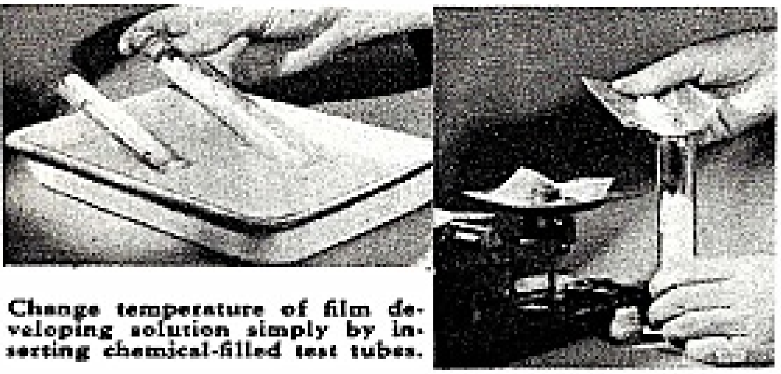

CUT SHOULDER TO TIGHT FIT ON DRIVE WHEEL
15/16"
1/8"
AXLE DETAIL
22GA. BRASS
BEND
3/8"
DRILL FOR AXLES AFTER BENDING
SOLDER TO SADDLE
1 5/32"
1 5/32"
1 5/32"
CUT OUT FOR PINION CLEARANCE
SOLDER TO FIREBOX
CYLINDER ENDS OF 22GA. BRASS SHEET OR PIECES OF BRASS ROD
3/16" DIAM. BRASS ROD
SOLDER
SOLDER
22GA. BRASS
BRASS CROSS HEAD
DRILL FOR 1/32" WIRE SLIDING FIT
SOLDER TO CROSS HEAD
1/32" PIANO WIRE
CROSS HEAD-PIN IS 4 D. NAIL HEAD

FIG. 10 – FITTING THE FRAME AND DETAILS OF CROSS HEAD ASSEMBLY

Frame is shown ready to be soldered into position. Do not drill axle holes until frame is bent to correct shape. Get depth of frame strap from Fig. 9 at top of page. Piano wire cross head guides are soldered to cylinder heads as shown above.

Chemicals In Test Tubes Cool or Heat Developer Solution



Change temperature of film developing solution simply by inserting chemical-filled test tubes.

IF YOU develop snapshots while on camping or vacation trips, take along two test tubes filled with chemicals to regulate the temperature of the developer. By adding a few drops of water to one test tube and placing it in the developer tray, the solution can be raised in temperature. Doing the same to the other test tube will lower the solution temperature.

The chemicals may be used over and over again in this manner until so much water has been absorbed that their power of heating and cooling is exhausted. The tubes are then emptied and refilled with fresh chemicals. Keep the tubes well corked, and add only a few drops of water at a time.

To make the heat-producing chemical, mix 90 grains of granular hypo with 12 grains of calcium chloride and five drops of undiluted glycerine. Mix this thoroughly with 2 ounces of sodium acetate, then seal immediately in the test tube.

The cold producing chemical is made by mixing together 1½ ounces sodium sulphate, 1 ounce potassium nitrate, and 1 ounce ammonium chloride. Weigh these ingredients out carefully on a good balance.

Check the temperature of the developer solution constantly with a good thermometer, inserting the hot or cold test tube as necessary to keep it constant.

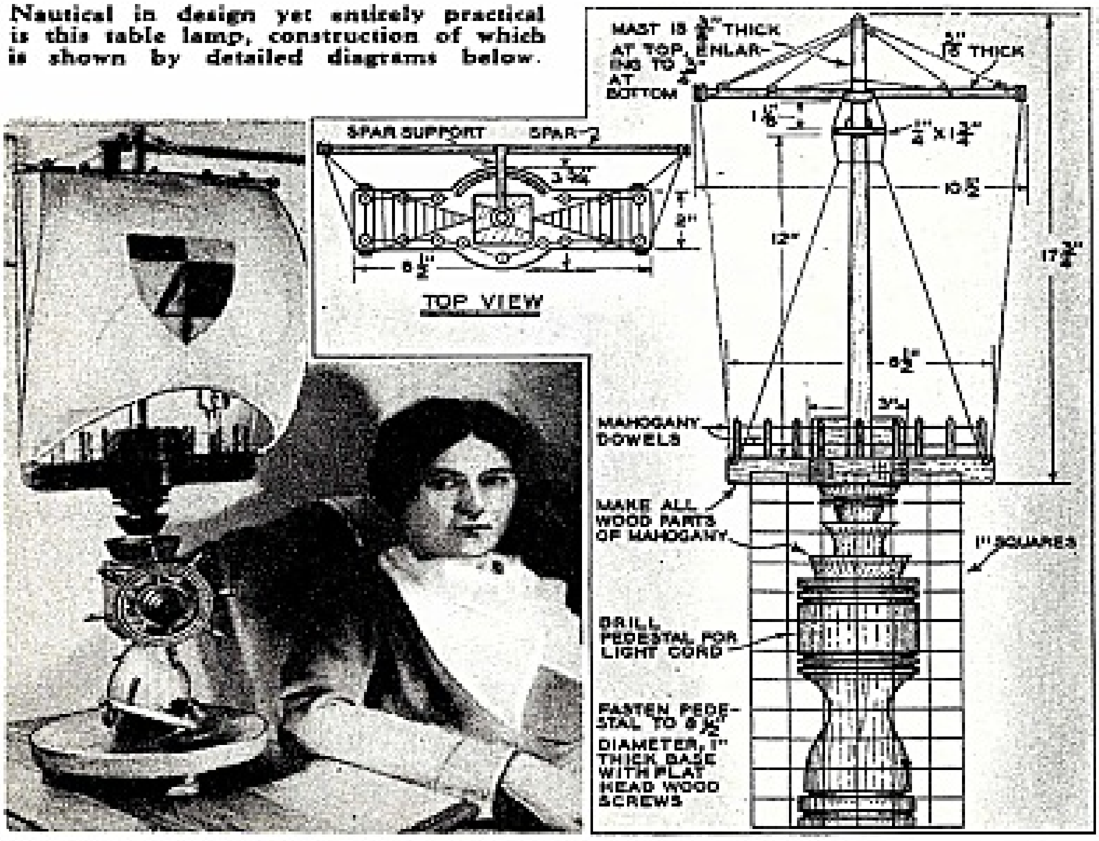
Sail Forms Shade of Novelty Lamp

A SQUARE-RIGGED sail serves as the shade for the two electric light bulbs in this nautical lamp. Mounted below the mast is the wheel, which may be placed on the shaft of a rotary switch to turn the lights on and off.

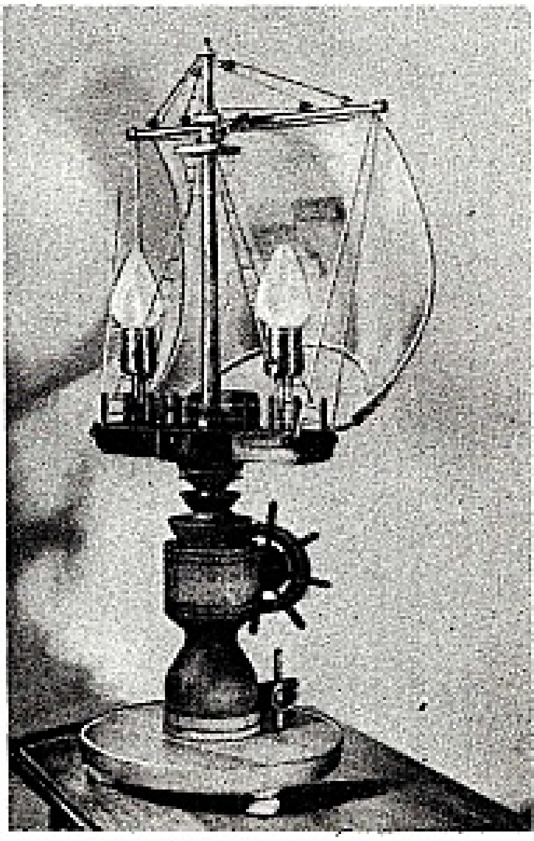
Turn down on your lathe to the dimensions shown for lamp support and spars, then sand smooth. A coat of light brown stain, polished with wax makes an excellent finish.

Use heavy fishing line for the rigging. Make the sail of brown muslin, painting on it a coat of arms or other design. When this design has dried, soak the sail for a minute in a solution of paraffin and gasoline, tie in place on the lamp with a graceful curve, then allow to stiffen.

Nautical in design yet entirely practical is this table lamp, construction of which is shown by detailed diagrams below.

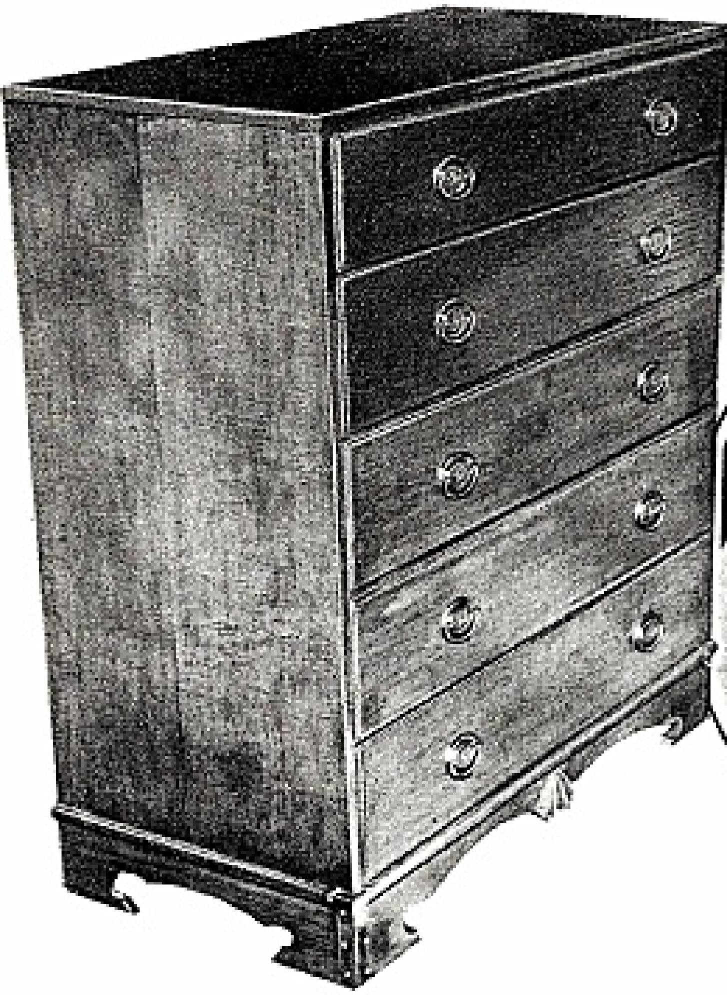


MAST IS 1/2" THICK AT TOP, ENLARGING TO 3/4" AT BOTTOM
5/16" THICK
SPAR SUPPORT
SPAR
3 3/4"
2"
6 1/2"
TOP VIEW
1 1/8"
3/4" x 1 3/4"
10 1/2"
12"
17 3/4"
6 1/2"
3 1/4"
MAHOGANY DOWELS
MAKE ALL WOOD PARTS OF MAHOGANY
1" SQUARES
DRILL PEDESTAL FOR LIGHT CORD
FASTEN PEDESTAL TO 6 1/2" DIAMETER, 1" THICK BASE WITH FLAT HEAD WOOD SCREWS

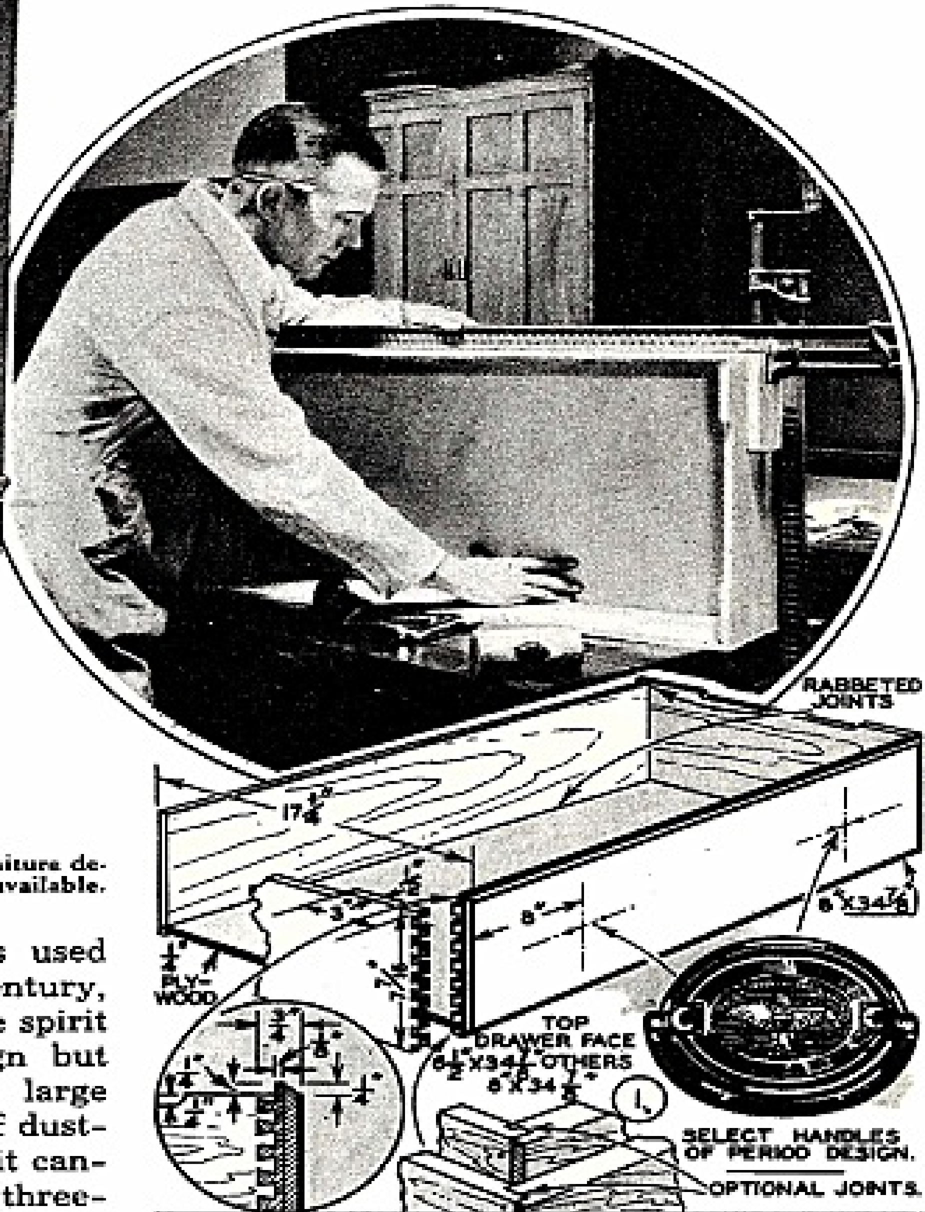


CHEST OF DRAWERS COMPLETES *Colonial Bedroom*

by O. E. OLSON



This Colonial chest completes series on bedroom furniture designed by O. E. Olson. Plans for other pieces are available.


RABBETED JOINTS
17¾"
3"
¼" PLYWOOD
8"
6"X34⅞
TOP DRAWER FACE 6½"X34½" OTHERS 6"X34½"
1
SELECT HANDLES OF PERIOD DESIGN.
OPTIONAL JOINTS.

Top—Olson is shown clamping the glued drawer pieces. Fig. 1 shows two joints that can be substituted for the dovetail.

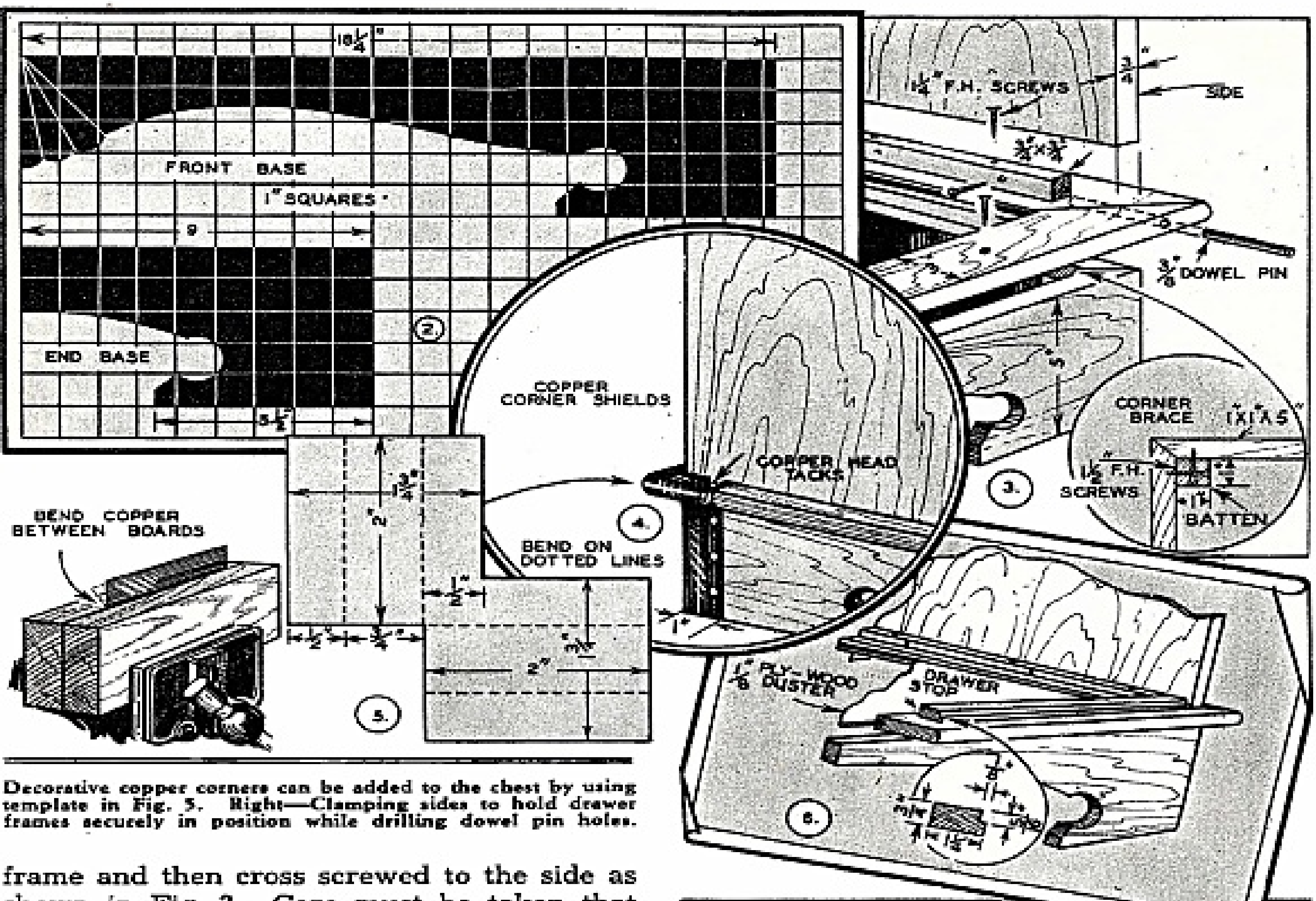
PATTERNED after Colonial pieces used extensively in the Eighteenth Century, this chest of drawers fairly radiates the spirit of Early America, not only in design but in type of construction as well. Its large spacious drawers offer the maximum of dustproof storage space, and in sturdiness it cannot be surpassed. It is built largely of three-quarter inch stock, either maple, white birch or walnut. Kiln dried hard maple is perhaps the most suitable wood.

First make the leg-frame of ¾-in. material. Cut the half patterns out of heavy paper following the graphed layout shown in Fig. 2. and trace directly onto the stock. Then cut to line on the band-saw and edge-dress with sand paper. Before assembling the frame, the carved design in the front piece should be worked in. As this involves only straight line carving it is quickly done. Miter-cut the ends and assemble with a 1"x1" batten strip as shown in Fig. 3.

Next make the base frame, Fig. 11, the inside edges of which are rabbeted to hold a ¼ in. plywood dustproofing panel. The front mitered corners are reinforced with ⅜ in. dowel pins as shown. Round front and end edges with a plane and sand smooth. Then screw the frame securely to leg-base assembly as shown in Fig. 3.

The sides and top are glued up of well matched boards. Be sure to strengthen joined edges with dowel pins and use a good grade of stainless glue. Clamp and let set for twenty-four hours. Cut sides and top to dimensions and sand smooth before assembling. A ¾"x¾" strip is screwed to base

COPPER CORNERS Decorate Base of COLONIAL CHEST


18 1/4"
FRONT BASE
1" SQUARES
9
②
END BASE
5 1/2"
1 1/4" F.H. SCREWS
3/4"
SIDE
3/4"x3/4"
3/8" DOWEL PIN
5"
CORNER BRACE
1x1x5"
1 1/2" F.H. SCREWS
BATTEN
3.
COPPER CORNER SHIELDS
COPPER HEAD TACKS
4.
BEND ON DOTTED LINES
1"
BEND COPPER BETWEEN BOARDS
1 3/4"
2"
1/2"
3/4"
2"
5.
1/8" PLY-WOOD DUSTER
DRAWER STOP
1 1/2"
6.

Decorative copper corners can be added to the chest by using template in Fig. 5. Right—Clamping sides to hold drawer frames securely in position while drilling dowel pin holes.

frame and then cross screwed to the side as shown in Fig. 3. Care must be taken that this strip is set far enough back to allow for the front drawer stop strip as shown in Fig. 6. This holding strip also serves as a drawer slide and should be flush with the drawer stop. The top assembly is carried out in the same manner, as shown in Fig. 8. The sides should be 35 in. apart, inside dimension, and square with base. Erect temporary cross bracing in back to hold assembly in position.

The four drawer frames of ¾ in. stock are made next, (Fig. 10.) For absolute dust-proof protection each frame encloses a ¼ in. plywood panel which fits in rabbeted channel.

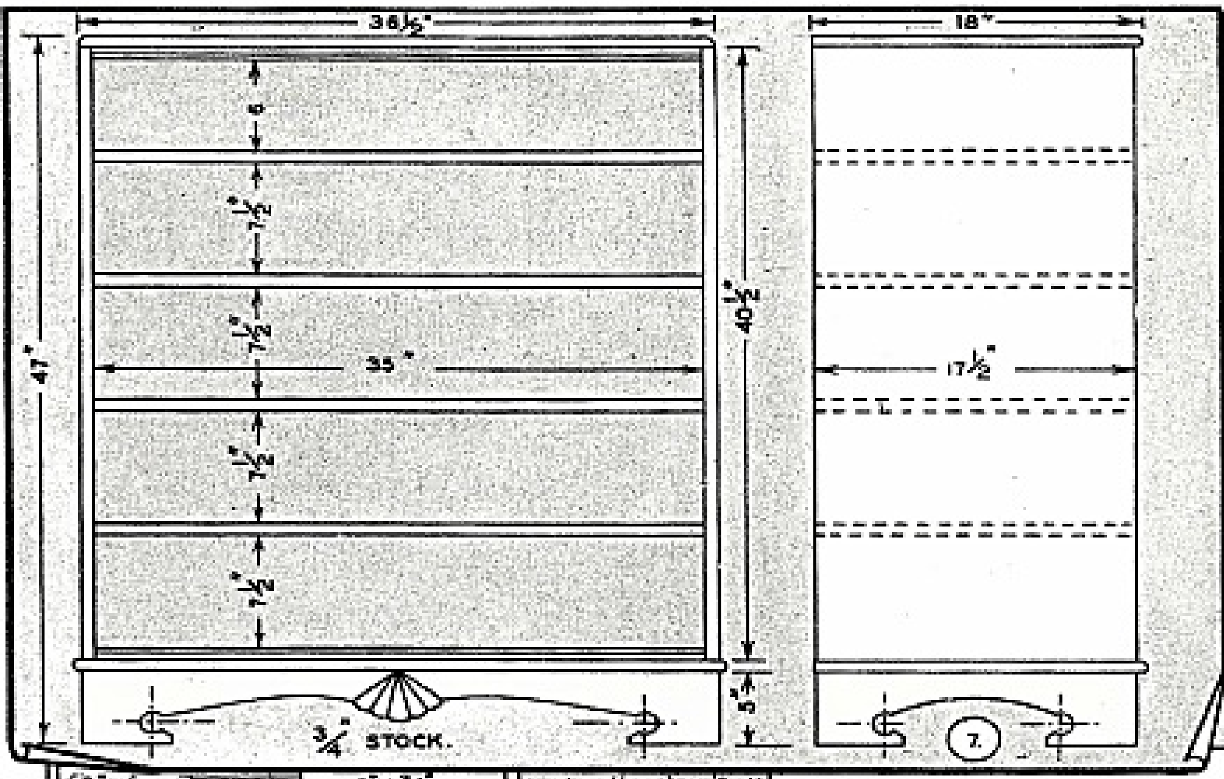
Mark out to exact dimensions the drawer spacings as shown in Fig. 7. Then fit in one frame at a time and draw up sides with two bar clamps to hold frame securely in position. Be sure that the frames are set in ⅛ in. from the front edge and ⅜ in. from the back edge to allow room for drawer moulding edge and back paneling to fit in.

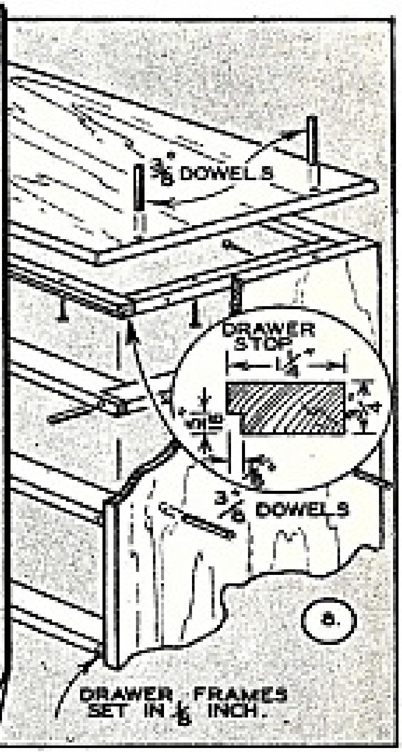
With the frame held thus in position, bore two ⅜ in. dowel pin holes in each side to a depth of two inches. Slide in temporary

COLONIAL FURNITURE BLUEPRINTS

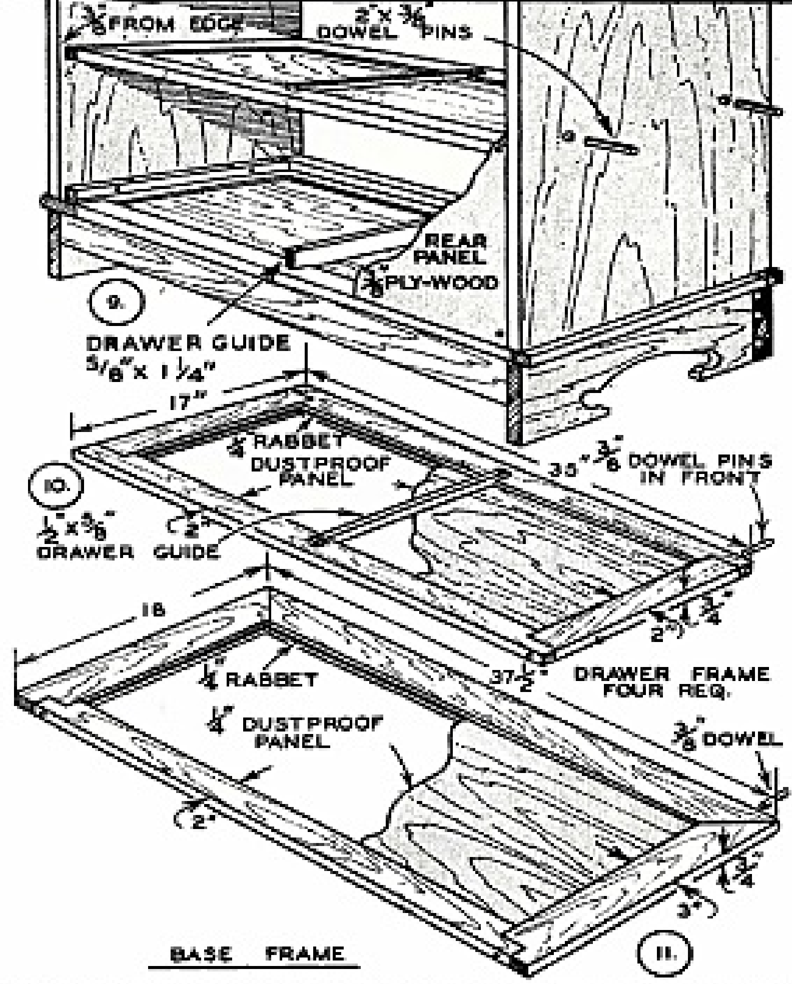
Colonial furniture blueprints can be obtained at twenty-five cents each for the following: Four-poster bed, bedside combination table and lamp, ladder-back chair, chest of drawers, bridge lamp, and coffee table. Send order to MODERN MECHANIX PUBLISHING COMPANY, Minneapolis, Minn.

DUSTPROOF PANELS FEATURE DRAWER FRAMES


36½"
47"
6"
7½"
7½"
35"
7½"
7½"
40½"
5"
¾" STOCK.
18"
17½"
7.


⅜ DOWELS
DRAWER STOP
1¼"
⅜ DOWELS
8.
DRAWER FRAMES SET IN ⅛ INCH.

Plans for completing frame of chest are shown here. Drawer stops (Figs. 6 and 8) are placed at forward edge of frames. The top is dowel pinned to the sides.


⅜ FROM EDGE
2"x ⅜" DOWEL PINS
REAR PANEL
⅜" PLY-WOOD
9.
DRAWER GUIDE ⅝"x 1¼"
17"
¼ RABBET
DUSTPROOF PANEL
35"
⅜" DOWEL PINS IN FRONT
10.
½"x ⅜" DRAWER GUIDE
2"
¾"
2"
18
¼ RABBET
37½"
DRAWER FRAME FOUR REQ.
¼" DUSTPROOF PANEL
⅜" DOWEL
2"
¾"
3"
BASE FRAME
11.

pins to hold frame in position and proceed in like manner with each of the other frames in turn. Then, glue and drive in all dowel pins.

Round front and end edges with a plane and sand smooth. Dowel pin top to the sides.

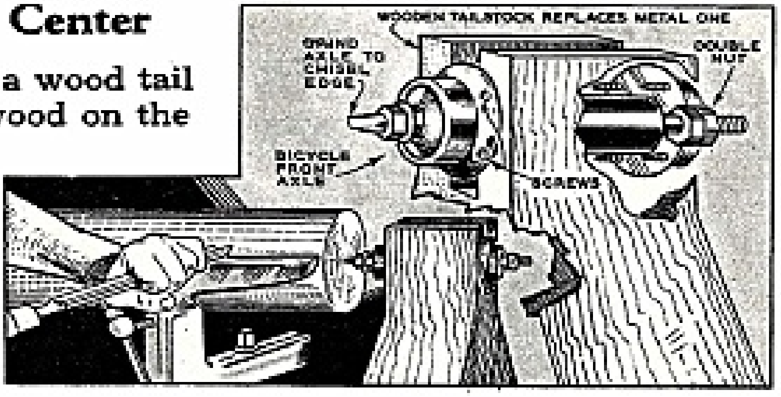
Each drawer face should be cut ½ in. greater in width than the space for which it is intended. Approximately $\frac{1}{16}$ in. allowance should be made at top of rabbet and across ends to compensate for wood swelling. Outer trim-cut can be made on drill press using a cutter bit in chuck. The two rabbeted joints in Fig. 1 are good substitutes for the dovetail union. Drawer backs and ends are solid ½ in. stock while bottom is of ¼ in. plywood. Drawer bottoms fit in rabbeted channel in back, front and ends. Notch lower edge of back to fit over drawer guide.

If the chest is made of hard maple or birch, the surface is stained with golden-oak stain which is quickly rubbed off leaving a mellow brown tone. Follow with two coats of rubbed wax. Do not finish red cedar veneered surfaces. If construction is of walnut, finish by first applying liberal coat of raw linseed oil, let stand one hour and wipe dry with clean cloth. Then sand the surface lightly and apply a coat of filler, wiping off any excess. When dry rub to smooth finish with very fine sandpaper over felt pad and apply coat of white shellac. Rub this down with fine steel wool and apply furniture wax.

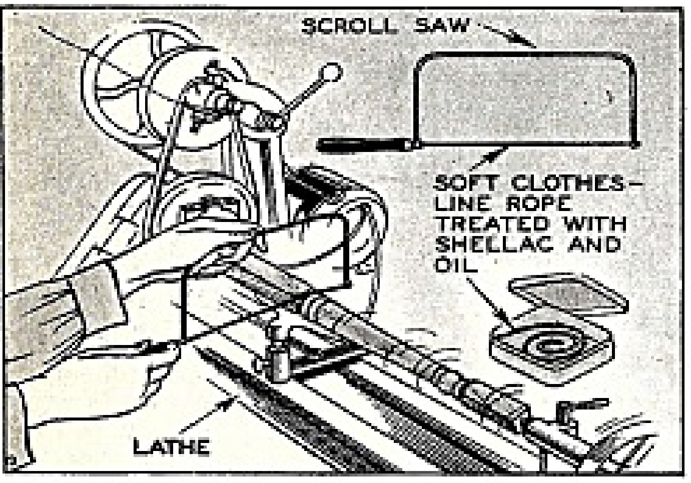
The copper corner shields add to the appearance and also protect the base corners. Pattern specifications are found in Fig. 5.

TIPS FOR WOOD TURNING

Bicycle Axle Makes Live Tailstock Center


WOODEN TAILSTOCK REPLACES METAL ONE
GRIND AXLE TO CHISEL EDGE
DOUBLE NUT
BICYCLE FRONT AXLE
SCREWS

A BICYCLE front axle assembly mounted in a wood tail stock forms a live center for turning soft wood on the lathe. The axle shaft is ground to a chisel point which holds the soft wood much more securely than the conventional type of point. The cone adjustment is secured by two nuts, and the axle is secured to the tailstock by small screws in the spoke holes. Chattering and vibration of turned stock is thus effectively checked.—H. R. Heydorf.

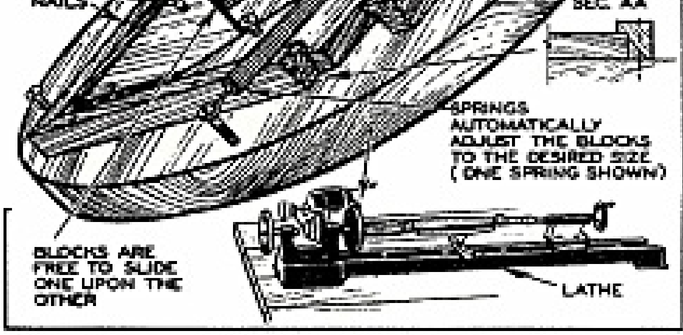

SCROLL SAW
SOFT CLOTHES-LINE ROPE TREATED WITH SHELLAC AND OIL
LATHE

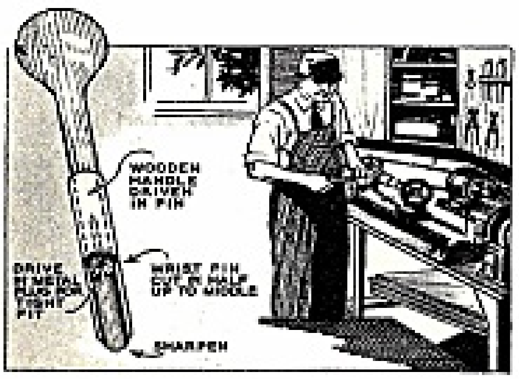
Rope Gives French Polish to Notches

WHEN using the French polishing method of finishing work in the lathe, a small soft clothesline rope is useful for getting into narrow grooves that cannot be reached with the usual cloth pad. Treat a length of rope with shellac and several drops of oil, as with a cloth pad, and then fasten it in a scroll saw frame as shown at left for ease in manipulating. Where the grooves are real fine, grocer's twine can be used in the same manner. The rope can be kept pliable for repeated use by coiling it in a metal can which can be closed with a tight fitting cover.—Kenneth Murray.

Faceplate Centers Odd Shaped Stock

THE setup shown here is remarkably convenient for holding flat squares, circles or octagons on the lathe faceplate for center boring, rosette cutting or other forms of ornamental turning. Upon a circular disk of wood attached to the faceplate is centered a square frame, rabbeted upon its inner edge. This frame holds four blocks of maple of near triangular shape as shown. The blocks are square on two of their edges which contact the frame, grooved on their long edge, and tongued on their short edge to fit the grooves. Movement of one block is duplicated by the others, thus keeping a true center.—
J. E. Hyler.


TRIANGULAR BLOCKS HELD TIGHTLY IN PLACE BY SPRINGS
SECTION AT F
MITERED
WOOD DISK
A
A
NAILS
SEC. AA
SPRINGS AUTOMATICALLY ADJUST THE BLOCKS TO THE DESIRED SIZE (ONE SPRING SHOWN)
BLOCKS ARE FREE TO SLIDE ONE UPON THE OTHER
LATHE

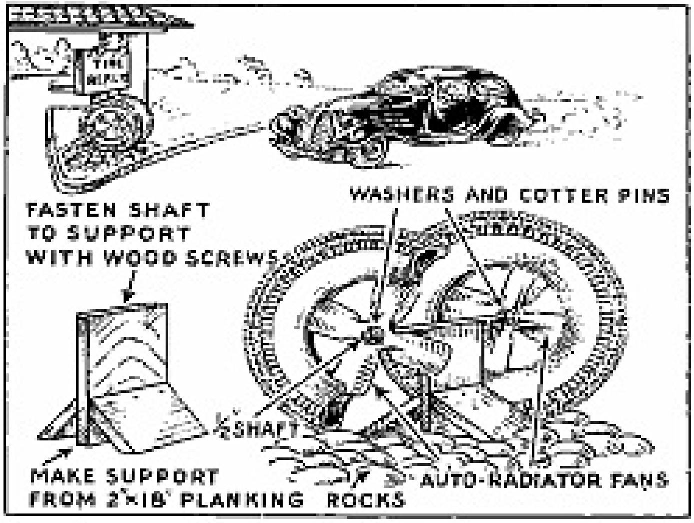

WOODEN HANDLE DRIVEN IN PIN
DRIVE IN METAL PLUG FOR TIGHT FIT
WRIST PIN CUT AWAY HALF UP TO MIDDLE
SHARPEN

Turning Gouge Made from Old Piston Pins

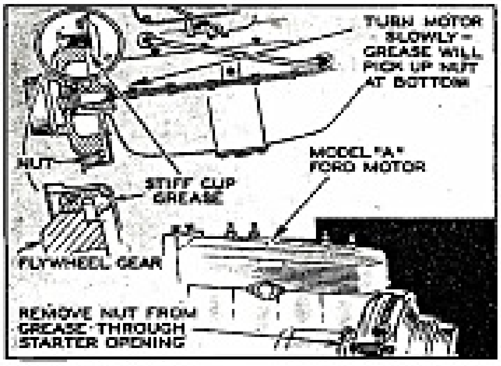
FROM discarded piston pins, which come in a great variety of sizes, can be made a full set of gouges for the home wood lathe. By cutting away or grinding out half of the pin half way down its length, one-half of the pin forms the socket, while the remaining section can be sharpened into a fine tool. Turn out your own handle.—M. DeVega.

FOR THE AUTO MECHANIC

Used Auto Fans "Speed Up" Tire Signs


FASTEN SHAFT
TO SUPPORT
WITH WOOD SCREWS
WASHERS AND COTTER PINS
SHAFT
MAKE SUPPORT
FROM 2"×18" PLANKING
ROCKS
AUTO-RADIATOR FANS

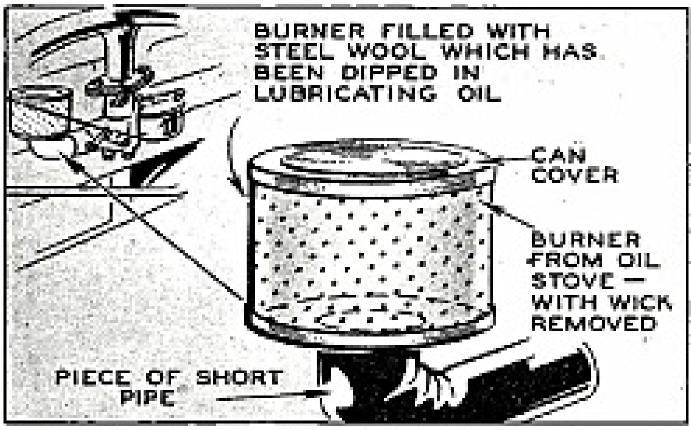
THE painted truck casing in front of a tire shop is beginning to have the same significance as a striped pole in front of a barber shop. A simple method of dressing up the sign is to line up two tires a short distance apart, and on a shaft running between them, mount two model T fans so that the tips of the blades are slightly within the casings. Any passing breeze is sufficient to cause the fans to revolve, and the effect from a distance is that of a furiously spinning wheel. A length of pipe screwed to a wood frame built to required size makes an axle for the fans. Cotter pins and washers hold the fans in place.—F. G. Stebley.


TURN MOTOR
SLOWLY -
GREASE WILL
PICK UP NUT
AT BOTTOM
NUT
STIFF CUP
GREASE
MODEL "A"
FORD MOTOR
FLYWHEEL GEAR
REMOVE NUT FROM
GREASE THROUGH
STARTER OPENING

Cup Grease Picks Up Bolts Lost In Gear Box

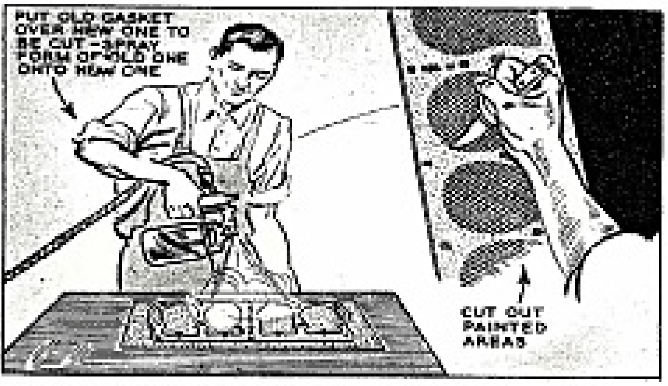
NUTS or bolts which have worked loose and fallen to the bottom of the flywheel casing or any other gear box can easily be retrieved by an application of stiff cup grease to the gears. Apply the grease in such quantity that the lump will just touch the edge of the gear housing. Then turn gear slowly. The lost nut or bolt will become embedded in the grease and carried around to where it may be reached, thus eliminating the need of removing the housing. Even bolts of large size may be removed in this manner.—Earl Myers.

Oil Soaked Steel Wool Makes Air Filter


BURNER FILLED WITH
STEEL WOOL WHICH HAS
BEEN DIPPED IN
LUBRICATING OIL
CAN
COVER
BURNER
FROM OIL
STOVE —
WITH WICK
REMOVED
PIECE OF SHORT
PIPE

STEEL wool, enclosed in a burner from an old oil stove makes an ideal dust filter for use on the carburetor of any car not already so equipped. First remove the wick from the burner, and then pack tightly with steel wool saturated with lubricating oil. Use a cover from a large tin can, such as a coffee can, to enclose the top and bottom. Cut a hole in the bottom cover and to it solder a short length of copper or tin tubing, the diameter of which is determined by the diameter of the carburetor's air intake. Carefully bend an elbow in pipe, and fit filter over air intake.—P. Robertson.

Spray Gun Maps Out Replacement Gaskets


PUT OLD GASKET
OVER NEW ONE TO
BE CUT—SPRAY
FORM OF OLD ONE
ONTO NEW ONE
CUT OUT
PAINTED
AREAS

A QUICK way of mapping replacement gaskets is furnished by the machine shop spray gun. Place the old gasket firmly upon the cork sheet or whatever material the gasket is to be made from, and apply one or two quick sprays of paint. Stenciled clearly upon the material will be an accurate outline of the old gasket, and all that is left to be done is to trim it out with a sharp knife. This is not only handy in a large shop doing much of this work, but assures accuracy in the home workshop. This method is also convenient for mapping out other projects.—J. Hall.

MEDIUMISTIC

by HAROLD L. ZIMMER

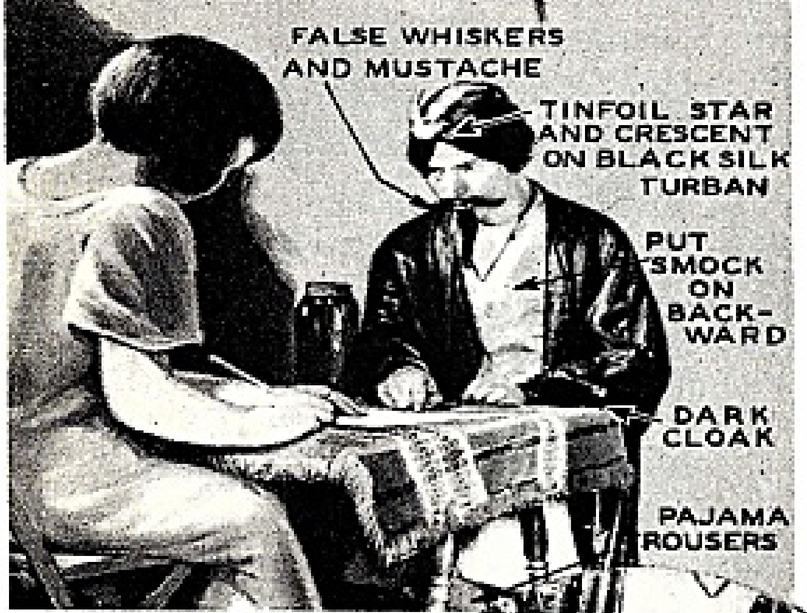
FOR new Hallowe'en thrills, put on a mediumistic party with turban-bedecked medium, darkened room, spirit writing, tables floating in the air, and all the other tricks which fake spirit mediums use so successfully. The mere suggestion, on your invitations, that all weak-hearted persons should stay at home will insure a crowd.

Drape a small room in the approved manner, placing a table and two chairs in the center, then assemble your own spirit-medium clothes. Messages from the spirit world enter this room *via* a simple but deceiving chemical trick. Call for one guest at a time, seating him opposite you at the table, then request that he write his name on the lower half of a sheet of paper. Roll up this paper, insert in an empty mason jar at your elbow, then intone:

"In a moment we shall have a message for you from the spirit world."

You pick up the jar shortly, and examine the paper through the glass. Mysterious writing is gradually forming. You remove the paper and hand it to your guest. "You will be wealthy," says the message. "Obey the medium in all things and you will never

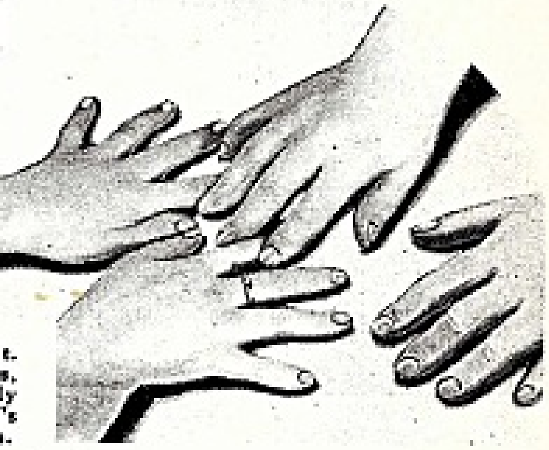
Spirit world messages magically form on paper placed in ordinary mason jar. Make turban from black silk cloth. Wear pajama trousers, a knee-length smock put on backward, pulled tightly around the body and pinned, a bright sash tied around the waist, and complete costume with a dark smock.


FALSE WHISKERS AND MUSTACHE
TINFOIL STAR AND CRESCENT ON BLACK SILK TURBAN
PUT SMOCK ON BACKWARD
DARK CLOAK
PAJAMA TROUSERS

The fact that scratches on slate are invisible when wet provides spirit writing for your party. Notch or mark side of slate on which message has previously been scratched with a glass. In a small gathering, use separate slates with different messages for each person. Place the slate aside as soon as the subject reads the writing, for closer examination may reveal the secret.

TRICKS for Your Hallowe'en PARTY

Subject (above) writes question on slate, and the medium obtains the answer "out of the air." Left—The table-lifting stunt.



The "joining hands" trick is exposed at right. Stroke both hands of subject first with two hands, then with one, in absolute darkness. Gradually stop rubbing, allowing fingers to rest on subject's hands. One hand is now free to ring bells.

go wrong." The message may be anything.

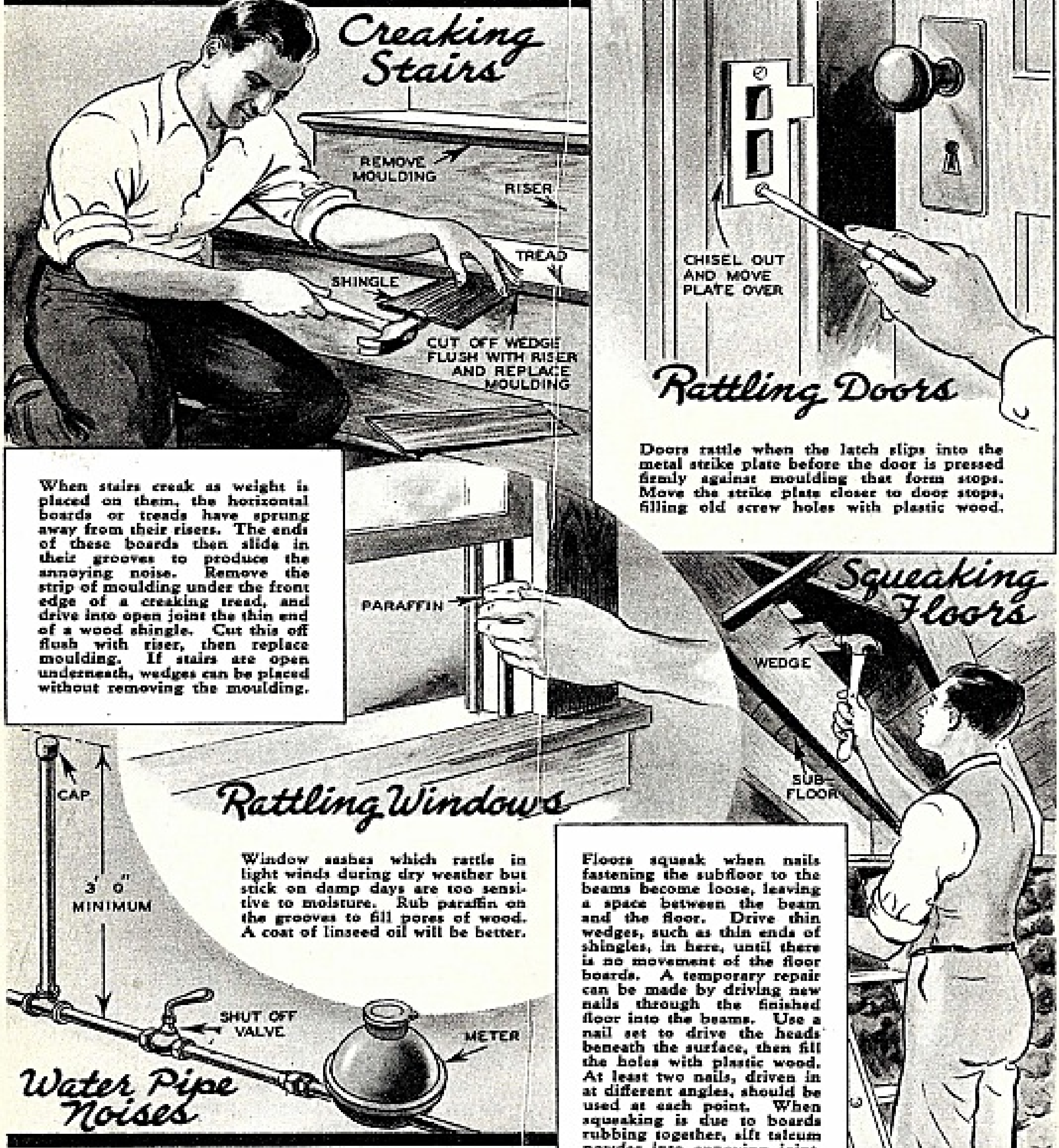
The secret: Get a bottle of slightly diluted copper sulphate at the drug store; also a bottle of ammonia and a pad of white paper. Using the copper sulphate for ink, write twenty or more messages on separate pieces of paper. As the liquid dries, it vanishes. The jar is filled with ammonia, allowed to stand a few moments, then emptied. What ammonia still remains in the form of fumes is sufficient to turn the writing dark, when the copper sulphate is exposed to it.

Another simple message trick, which is widely used, is the heat treatment. Use a glass-topped table for this, and have a sheet of tin or aluminum underneath, to keep it from being cracked. Fasten an electric iron to the under side, and adjust it to its lowest heating point. Run the wires down the table leg and under the rug. With cardboard or plywood, build a false bottom under the table to keep the iron from being seen. An assistant can turn the iron on a few minutes before it is needed or you can place a switch under the rug.

Write with *dilute* sulphuric acid this time. The guest writes his name, tears off the sheet

[*Continued on page* 128]

Curing HOME SQUEAKS and RATTLES



Creaking Stairs

When stairs creak as weight is placed on them, the horizontal boards or treads have sprung away from their risers. The ends of these boards then slide in their grooves to produce the annoying noise. Remove the strip of moulding under the front edge of a creaking tread, and drive into open joint the thin end of a wood shingle. Cut this off flush with riser, then replace moulding. If stairs are open underneath, wedges can be placed without removing the moulding.

Rattling Doors

Doors rattle when the latch slips into the metal strike plate before the door is pressed firmly against moulding that form stops. Move the strike plate closer to door stops, filling old screw holes with plastic wood.

Rattling Windows

Window sashes which rattle in light winds during dry weather but stick on damp days are too sensitive to moisture. Rub paraffin on the grooves to fill pores of wood. A coat of linseed oil will be better.

Squeaking Floors

Floors squeak when nails fastening the subfloor to the beams become loose, leaving a space between the beam and the floor. Drive thin wedges, such as thin ends of shingles, in here, until there is no movement of the floor boards. A temporary repair can be made by driving new nails through the finished floor into the beams. Use a nail set to drive the heads beneath the surface, then fill the holes with plastic wood. At least two nails, driven in at different angles, should be used at each point. When squeaking is due to boards rubbing together, sift talcum powder into annoying joint.

Water Pipe Noises

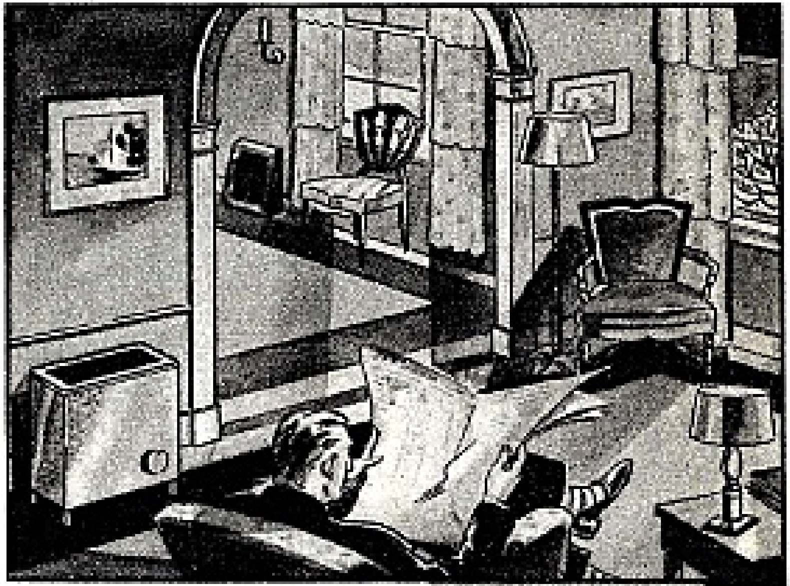
Thumping noises in water pipes when faucets are turned off abruptly are evidence of water hammer. They can be prevented by placing somewhere in the plumbing system a body of air that acts as a cushion, to absorb the momentum of the water. Place a vertical pipe at least three feet long above the top faucet in the system or at any other point, with the top end tightly capped. Arrange so that water can be drained out of air pipe from time to time when cap is removed.

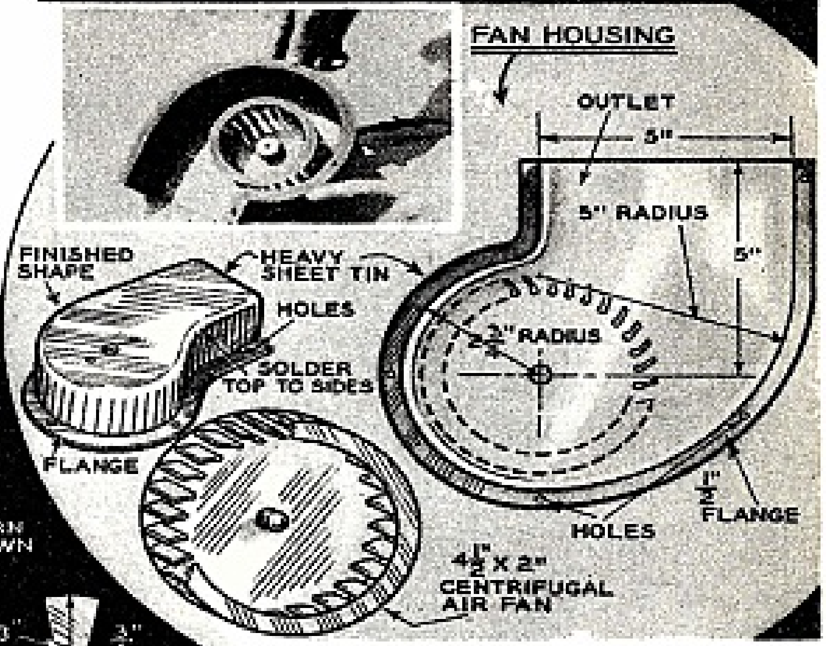
Hot Air BOOSTER Cuts Fuel Bills

DO YOU have rooms in your home that are difficult to heat with the hot air furnace when the temperature drops down to around zero? Instead of wasting coal or oil in useless attempts to force heat into these rooms, overheating all of the other rooms, build this hot air booster. Owners of hot air furnaces have reported savings of as much as one-third in winter fuel bills after using this efficiency booster.

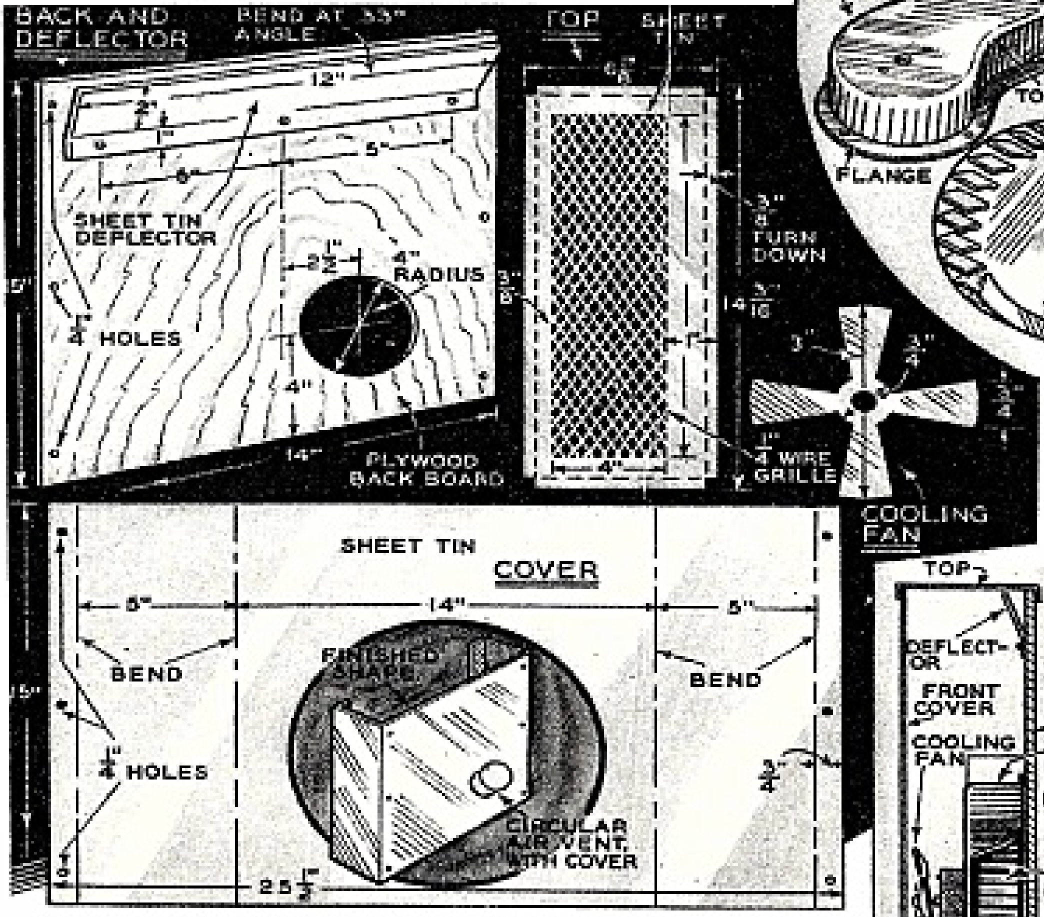
Simply set the booster in front of a hot air register, then plug into an electric socket. It will break the dead air "vacuum" in the furnace pipes, starting circulation of hot air in a few minutes. Used in summer, the booster will draw cool basement air up into a room. The cost of operation is no more than that for a small electric fan.

Compact and light in weight, the unit may be moved from room to room as necessary. It is simply a centrifugal air fan driven by a small electric motor and mounted in a compact housing of metal and plywood. Many auto heaters have suitable fans.

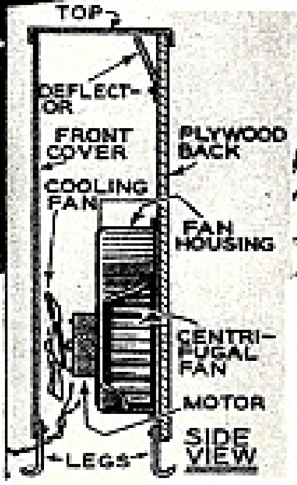



FAN HOUSING
OUTLET
5"
5" RADIUS
5"
FINISHED SHAPE
HEAVY SHEET TIN
HOLES
$2\frac{3}{4}$" RADIUS
SOLDER TOP TO SIDES
FLANGE
$\frac{1}{2}$" FLANGE
HOLES
$4\frac{1}{2}$" X 2" CENTRIFUGAL AIR FAN

The centrifugal fan creates a vacuum to force hot air from the furnace pipes out into the room. Hub of fan should be in line with the short side of the outlet opening. Cut the top of the housing first, then solder to the side pieces, after forming the flanges in a vise or with pliers.


BACK AND DEFLECTOR
BEND AT 35° ANGLE
12"
2"
1"
5"
6"
SHEET TIN DEFLECTOR
$2\frac{1}{2}$"
4" RADIUS
15"
$\frac{1}{4}$" HOLES
4"
14"
PLYWOOD BACK BOARD
TOP
SHEET TIN
$6\frac{1}{8}$"
$\frac{3}{8}$" TURN DOWN
$\frac{3}{8}$"
$14\frac{3}{16}$"
1"
4"
$\frac{1}{4}$" WIRE GRILLE
3"
$\frac{3}{4}$"
COOLING FAN
SHEET TIN
COVER
5"
14"
5"
BEND
BEND
FINISHED SHAPE
15"
$\frac{1}{4}$" HOLES
$\frac{3}{4}$"
CIRCULAR AIR VENT WITH COVER
$25\frac{1}{2}$"

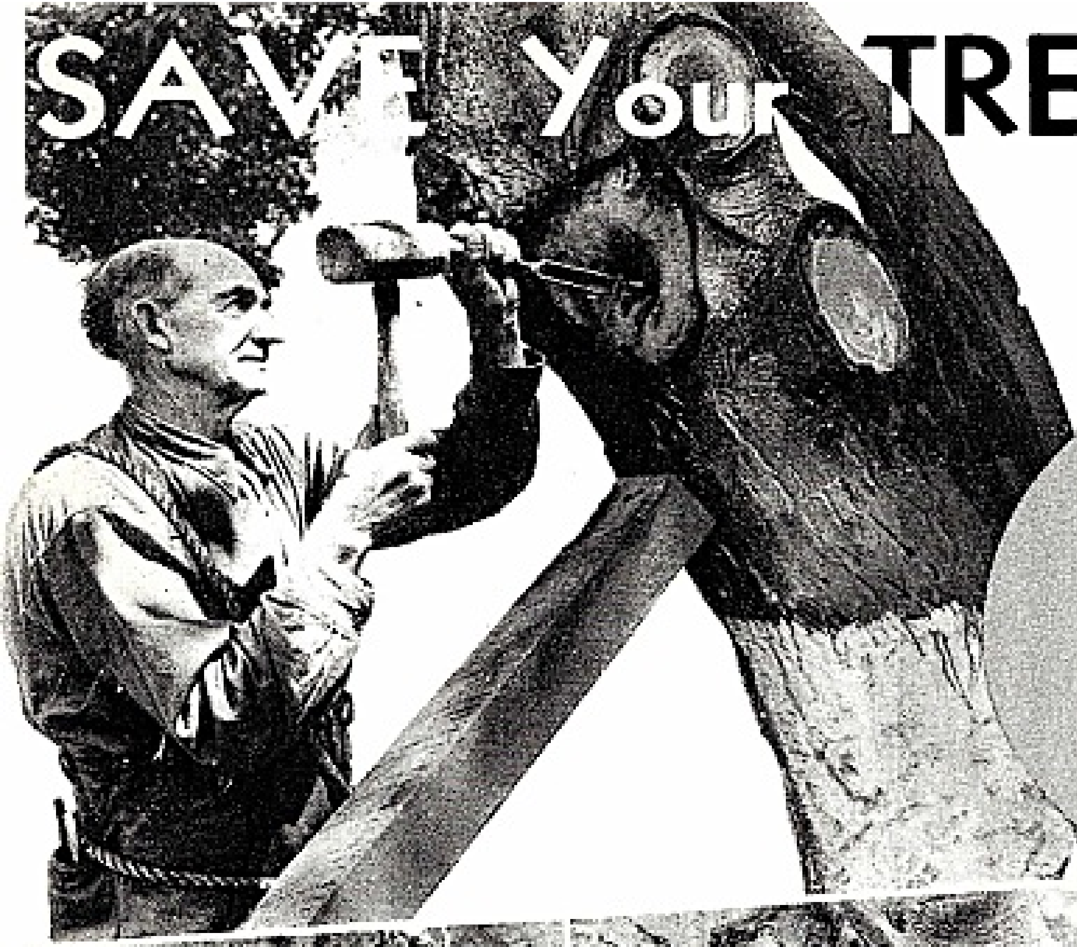
All necessary dimensions for this hot air booster are given in the above diagrams. Plywood panel faces hot air register. Wire or metal grill covering top prevents small objects from dropping into fan. Use heaviest sheet metal available, to give a sturdier unit. Deflector sends the air away from the walls, into the room.

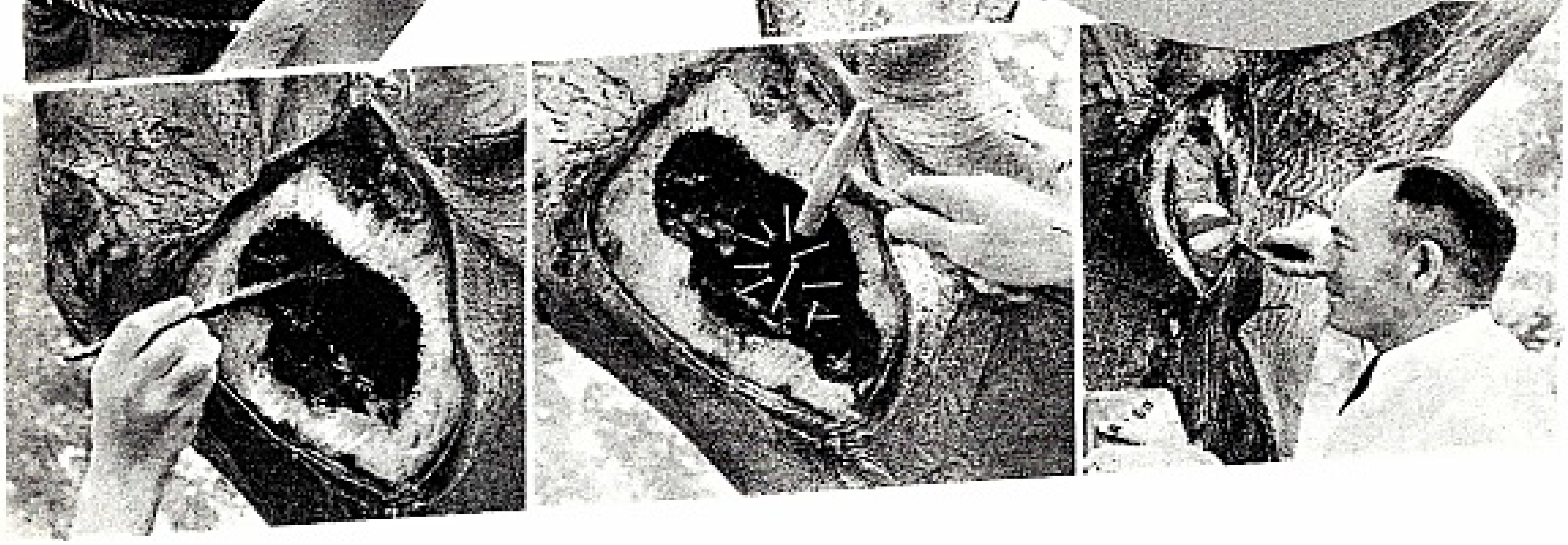

TOP
DEFLECTOR
FRONT COVER
PLYWOOD BACK
COOLING FAN
FAN HOUSING
CENTRIFUGAL FAN
MOTOR
LEGS
SIDE VIEW

All parts are shown here mounted on the backboard. Fan cools the electric motor. Beveled instead of square corners on sheet metal housing will improve the appearance of this booster.

SAVE Your TREES With

by
JAMES BOWLES





The first step in tree surgery is the removal of all decayed or termite-infested areas with a gouge or wood chisel and a wood mallet, as at the left.

●

After cleaning out the "wound," apply with a stiff brush a thin coating of equal parts creosote and roofing asphalt, to disinfect, then drive in six-penny galvanized nails to form a pin wheel reinforcement over the cavity. Fill wound with nearly-dry concrete, moulding to a small bulge with a trowel to allow for any shrinkage in setting.

LIKE athletes, those trees grow to largest sizes and yield record returns in beauty and fruits which are properly nourished, protected and permitted to exercise. Although their heads bow under the scourge of disease and accident, trees possess remarkable recuperative powers and will grow vigorously following radical surgical operations which rid them of pests and decay.

No wizardry is involved in growing healthy trees. Whether you have one or a thousand, the same rules apply. You require no tools other than the few simple ones to be found in almost any kit. In only rare cases need you call on expert aid to restore an ailing tree, no matter whether it is an ornamental on a city lot, or a fruit tree among an orchard of hundreds.

Many species will spread as wide as they are tall. When planting, therefore, space the saplings in parallel rows. Peaches and apples, for instance, should be spaced 20 feet apart in one direction, 22 the other. The extra width will leave ample room in one direction to drive a wagon or tractor during the picking season. By this method you can have 18 trees on a lot measuring 60x132 feet. Walnuts and oaks are, of course, exceptions, for these grow to prodigious sizes as compared with most trees.

Do not crowd the roots when planting. Dig the hole just deep enough so the young tree will rise from the level to which it was accustomed before transplanting, and wide

Saw-and-Chisel SURGERY

Give those prized shade trees a physical examination this fall, then follow these instructions for tree surgery and trimming.

Proper trimming gives personality to shade trees. By cutting away the lower branches and stripping those remaining, the walnut tree shown here has been changed into a "silhouette" ornamental. It will continue to bear heavy yields.

enough at the bottom so the roots can spread naturally. Fill the hole about three-fourths full with top soil, then pour in 10 to 15 gallons of water. Do not tamp the earth down. Use no fertilizer around the roots. Trim the branches, leaving stubs about four inches long.

You may start developing the tree into any shape you want it to take during the second winter after planting. Cut out all but three or four equally-spaced and sturdy branches.

The newest wrinkle in tree trim is the "silhouette effect." This may be obtained with virtually any kind of tree, whether strictly ornamental or fruit-bearing. Fruit and nut trees can be made ornamental, at the same time retaining high productivity, in a single season. Follow any pattern you choose, to develop individualism.

To trim for ornamental effects, take off the branches as high as you wish, leaving those at the top to spread. For the silhouette, skin the remaining limbs from the trunk out toward the ends until you have remaining the desired foliage. Small limbs may be cut off with a concave-blade saw, attached to a pole of necessary length. Sever the limbs by pulling the saw toward you.

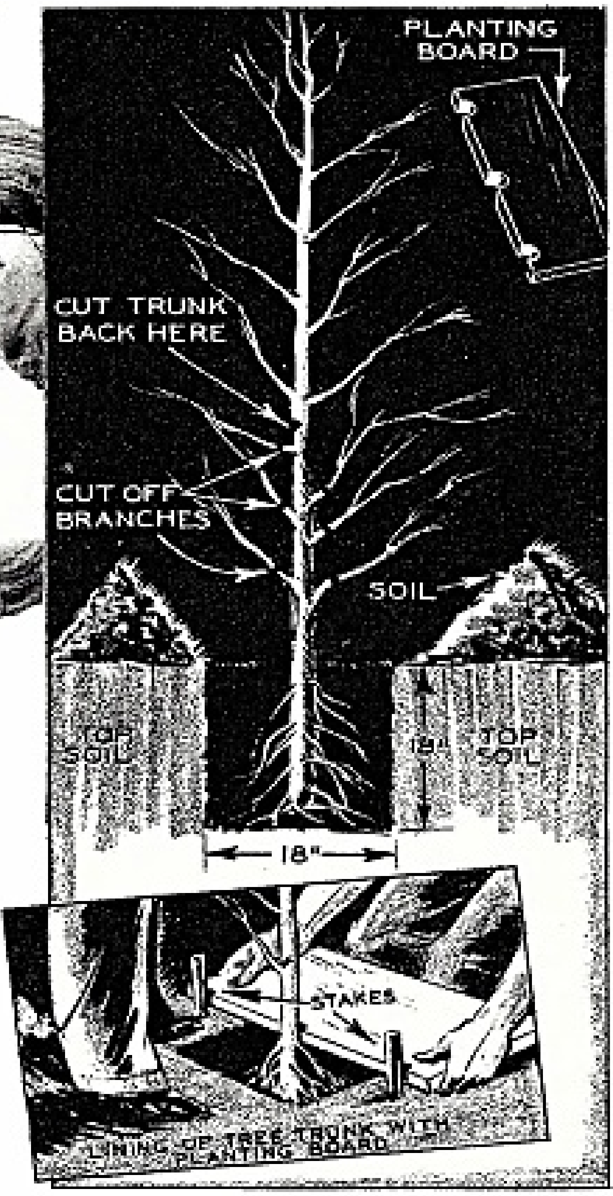
By observing a little precaution, you can cut limbs of any size without danger of splitting the cambium layer on the trunk. Limbs three inches in diameter or smaller should first be severed by pole or ordinary cross-cut saw three feet from the trunk. Then carefully cut the stub off flush with the outer side of the cambium layer and cover the scar with a sealing preparation, preferably emulsified asphalt.

Larger limbs, of no matter what diameter, may also be removed safely and easily by following these directions: With a cross-cut saw, cut upward five feet distant from the trunk through one-third of the limb's diameter. From the trunk side, notch a V, using an axe. With the notch completed, saw downward five or six inches nearer the trunk. When the weight causes the limb to sag, it will break off at the V, and will not strip off a long section of bark or split the trunk. Finally, cut off the stub as directed for smaller branches, and smear the sealing substance over the open wound. The cambium layer will continue feeding the tree and will re-grow without undue delay.

Never drive iron nails into or otherwise mar a tree, for it is from such simple beginnings that decay eats into limbs and trunk, giving termites an opportunity to bore long tunnels and eventually bring death to even the finest and largest specimen. Although

WHEN PLANTING TREES, DO NOT TAMP GROUND

Small limbs may be cut off without ladder with concave blade pole saw. Wrap sunburned branches in burlap after treating.



The proper way of planting shade and orchard trees is illustrated here. The planting board is used only when placing trees in rows. Never tamp the soil down over the roots.

trees, when properly nurtured, possess unbelievable recuperative powers, they react quickly to adverse physical conditions. For that reason, you should give them every chance to develop their natural beauty.

Most diseases and injuries may be easily combated and repaired with easily available and inexpensive remedies and tools. The most common ailment—rot—may be quickly eliminated by following these simple steps:

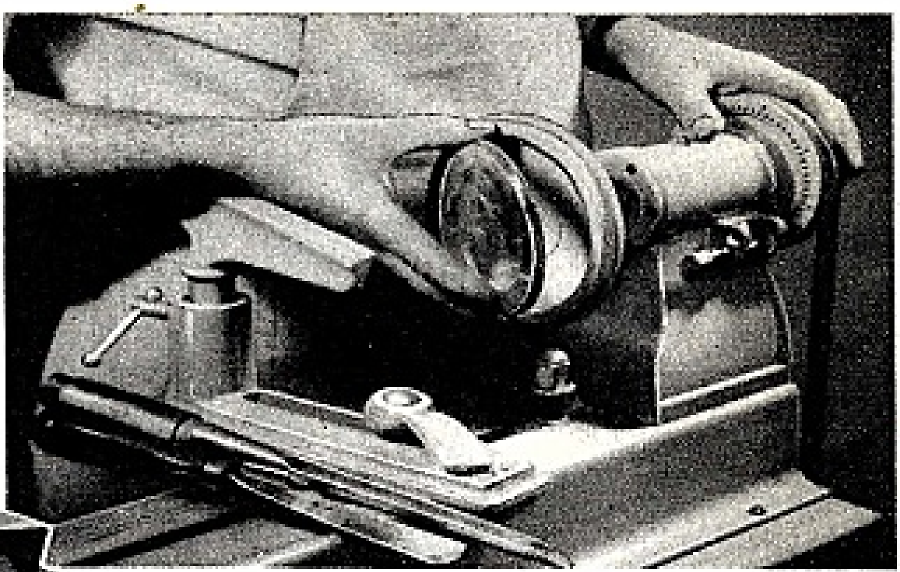
First, using an ordinary wood or gouge chisel and a wooden mallet or household hammer, clean out the cavity completely. If you find woodborers, termites, ants or any other insects, make sure you eradicate all of them. Should you discover termites tunneling through the wood, bore holes—do not chip—with an auger of the appropriate size horizontally seven-eighths the distance through the trunk every foot above the cavity until inspection of the cross-sections reveals you have passed the top of the tallest tunnel. Then suspend cotton saturated with carbon bisulphide in the upper hole or treat with creosote. The fumes tend to go down, and this will kill any workers remaining. Should the holes go downward from the cavity, you need only pour creosote into the tunnels. Do not permit the creosote to contact the bark.

In "operating" on a tree, proceed much as a dentist works on a cavity in a tooth. After completing the cavity and removing the diseased parts, apply a mixture consisting of equal parts of creosote and roofing asphalt on all exposed wood. Use a small, stiff brush and make sure the entire cavity and outer surface are completely but sparingly covered. The creosote penetrates the wood, while the asphalt remains as a permanent protective coat.

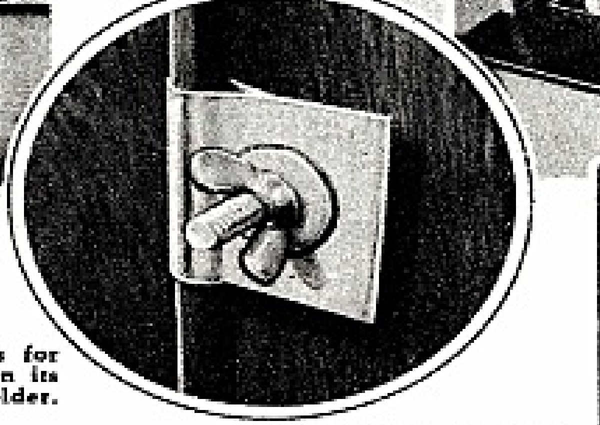
Allow the antiseptic to dry. Usually this will require only three or four hours. Now apply the reinforcing, by driving 10 or 12 six-penny *galvanized* box nails into the wood no farther than one inch inside the cambium

[*Continued on page* 120]

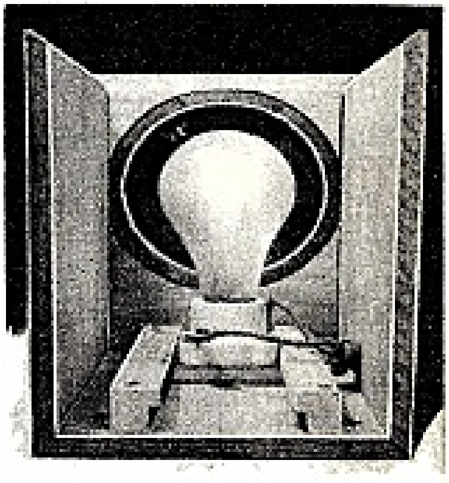
Spotlight Uses Photoflood Lamp



The condensing lens should fit snugly inside the turned hardwood holder. Ventilating cover cam is shown below.



Amateur photographers will find many uses for this powerful spotlight. The lens is held in its frame by gluing cardboard strips to the holder.



Make top and bottom pieces of housing 5¼"x8", sides 7½"x8", front and back 7½"x5¼", hinged door in back 3½"x4½", ventilating opening in top 2"x6½", and ventilating cover 3"x7½".

THIS simple spotlight may be used in securing artistic lighting effects for interior photography, as well as in giving that professional touch to amateur theatricals. The focus is easily adjusted to give either a concentrated beam of intensely bright light, or a broad floodlighting effect with the 200-watt bulb.

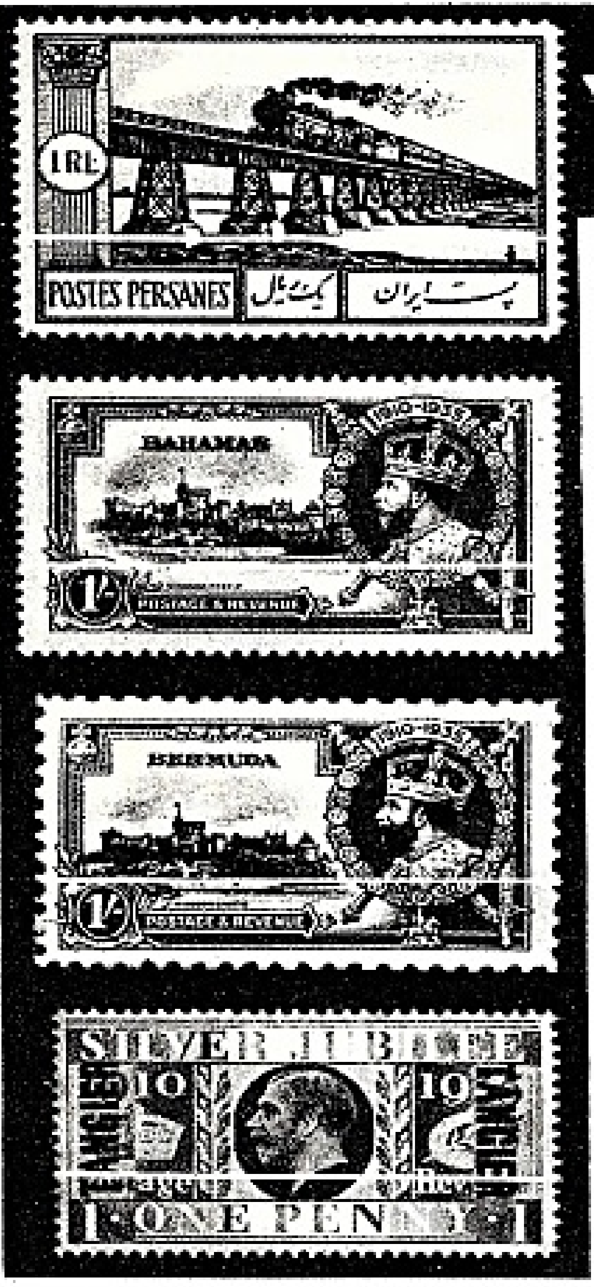
Taking advantage of the low heat output of the modern photoflood lamp used, the lamphouse is made of ⅜" plywood, with sides mitered before assembling with waterproof casein glue and brads.

Two strips of wood screwed to the bottom serve as a track for the porcelain lamp socket. This lamp is moved back and forth by means of a dowel stick projecting through the rear of the lamphouse. An eccentric wood wheel glued to one end of another dowel turns to push up the ventilating cover at the top.

A 4½" diameter plano-convex condensing lens is used, with the convex side toward the light. This lens can be secured from a photo supply house for less than a dollar.

A bolt, wing nut, and strip of spring steel bent into a "U" shape are used to fasten the spotlight to the upright of a music stand or to a homemade base. The spotlight can then be easily raised, lowered, or swung to any position. Drill holes in the bottom of the lamphouse for ventilation.

With The Collectors



Persia is no more—Iran is the new name! One of the last stamps to be issued with the familiar **POSTES PERSANES** name is pictured at the top of this column.

Great Britain's Silver Jubilee celebration brought forth more than one hundred stamps, all in the same design, differing only in color and in the country name. Two of these, from Bermuda and Bahamas, are shown above. Great Britain issued Jubilee stamps, but in a different design, which was later surcharged as shown for Tangier protectorate.

●

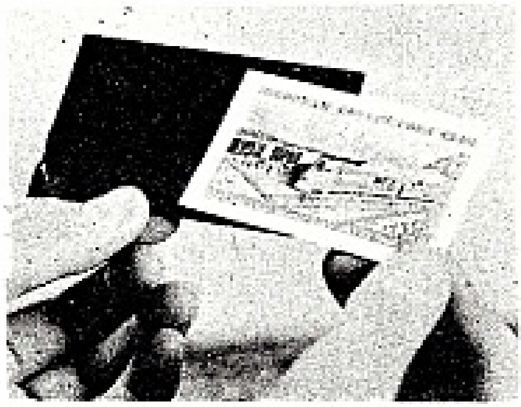
To protect valuable stamps, collectors are placing them in transparent mounts, then hinging the mounts to album pages. The sliding front type (right top) is simply a transparent, non-shrinking cover folded over stiff black card. Illustrated with slide is poster stamp put out by a Chicago stamp club for their annual show. Just below is another type of mount, in which the stamp is first placed in a transparent tray.

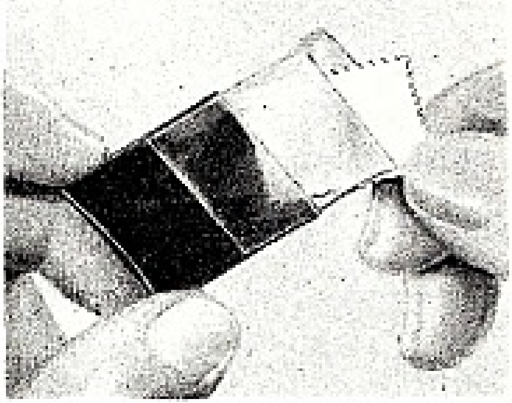
●

The envelope at the right contains the entire set of six Canada Silver Jubilee stamps, mailed to the Hobby Editor on the first day the stamps were issued.

STAMP photos may be taken without a camera, by using the stamp itself as the negative. Remove all paper and hinges from the stamp by a water bath, then dip in benzine to make it semi-transparent. Wipe off surplus benzine, then place the stamp in a printing frame with the face in contact with the sensitized surface of some printing paper. An exposure of 12 seconds at two feet from a 100-watt lamp is about right for stamps of average thickness, like those from Great Britain. After development you have a reversed negative image. In the second stage of the process place this print and a fresh sheet of printing paper face to face, and expose for between 35 and 60 seconds. A perfect reproduction can be obtained with most foreign stamps. It is of course against the law to photograph U. S. stamps in this manner.

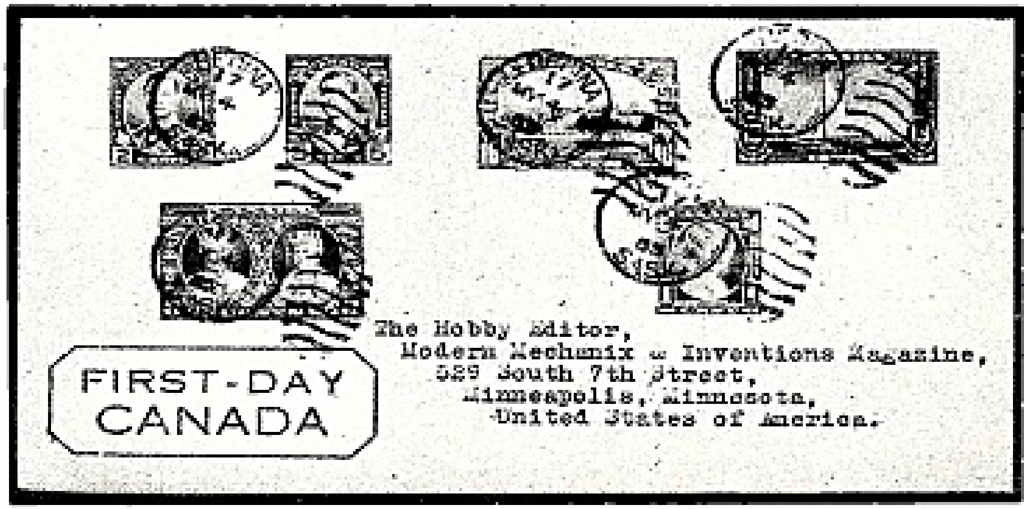
When mint stamps stick to your album they can be removed by placing a moist blotter against the paper backing and pressing stamps with flatiron.





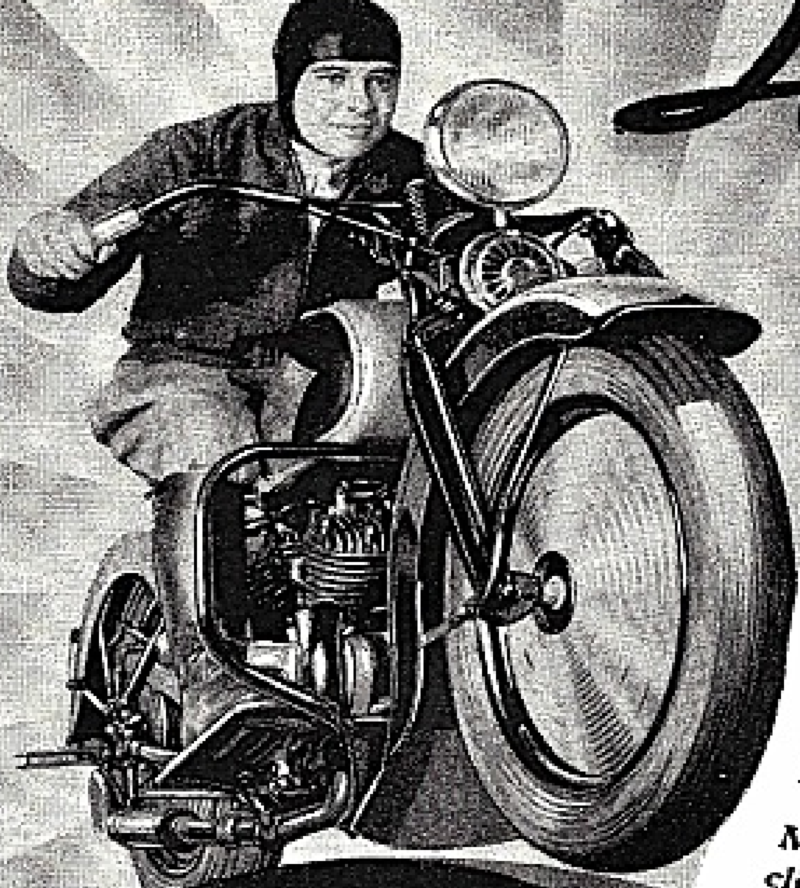
NEW U. S. STAMP

On Nov. 1, 1935, Uncle Sam will place on sale for the first time the new three-cent Michigan stamp. To secure first day cover, send a self-addressed envelope with 3c in *coin* to Postmaster at Lansing, Mich.



The Hobby Editor,
Modern Mechanix & Inventions Magazine,
529 South 7th Street,
Minneapolis, Minnesota,
United States of America.

FIRST-DAY
CANADA



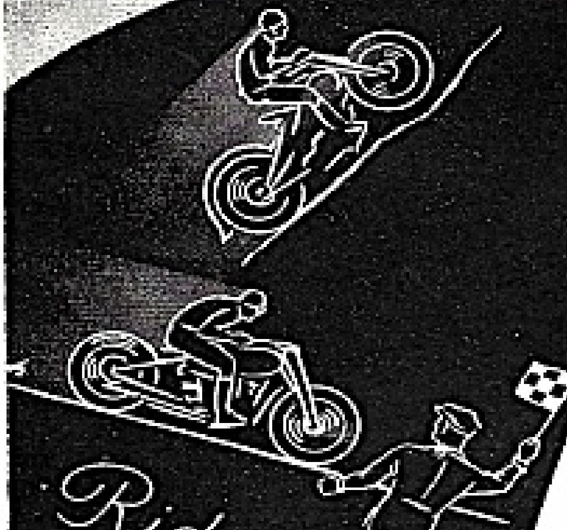
Topping

EVERYTHING ON WHEELS

YOU are king of the highway when you pilot a 1935 Harley-Davidson. Airplane speed — lightning acceleration — mighty power — are yours at a mere twist of the throttle. Little wonder these new Harley-Davidsons are sweeping to victory on hill, road and track.

Maybe you will not go in for hill-climbs, endurance runs and racing — but when you feel the full-surging power of its mighty motor —you're glad you're riding a 1935 Harley-Davidson. On the open road it flashes down the straight stretches or zooms up and over the hills like a speed-plane—making you "tops" with everything on wheels.

See your nearby Harley-Davidson dealer right away. Ask him for a free ride—let him explain his Easy Pay Plans—and send in the coupon.



Ride a

HARLEY-DAVIDSON

HARLEY-DAVIDSON MOTOR CO.
Dept. MM., Milwaukee, Wis.

Interested in motorcycling. Send illustrated literature. Postage stamp is enclosed to cover mailing cost.

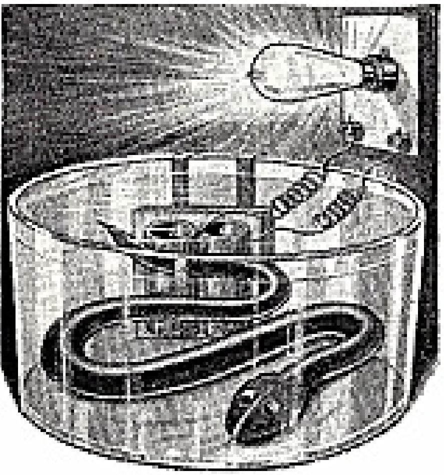
Name ....

Address ....

My age is ☐ 16-19 years, ☐ 20-30 years, ☐ 31 years and up, ☐ under 16 years. Check your age group.

PARAGRAPH ODDITIES
OF SCIENCE

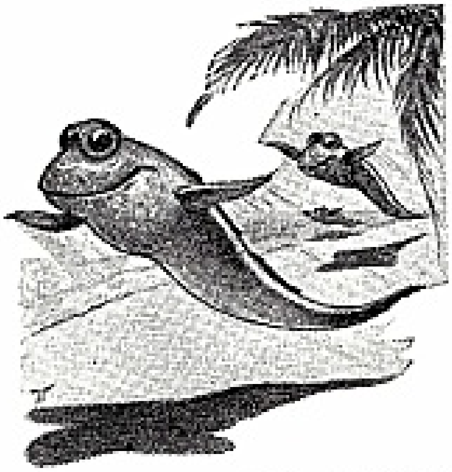
ELECTRIC eels from the Amazon river of South America can discharge enough electricity to light a neon tube or stun a man. The electricity can be sent in any direction. The eel attains a length of 8 feet.



The 160,000 h.p. plant of the S. S. *Normandie* is not the most powerful afloat. The aircraft carriers, *Lexington* and *Saratoga* both have 180,000 h.p.

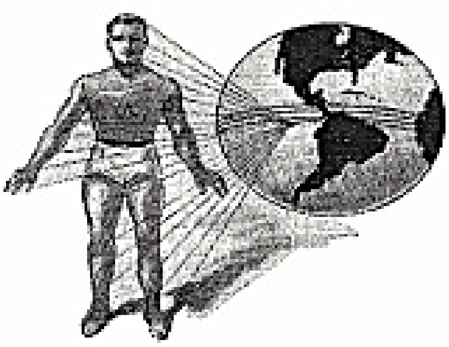
Many phosphorescent creatures emit no light until after the sun has set, even when placed in completely dark rooms where the sun has no effect.—Ulrich B. Cochran, Barkerville, B. C.

The mud-springer, Periophthalmus Koelreuteri, although a true fish, spends much time out of water. It moves on its pectoral fins, and can spring three or four times its own length.—Paul C. Swaim, Berkeley Springs, West Virginia.

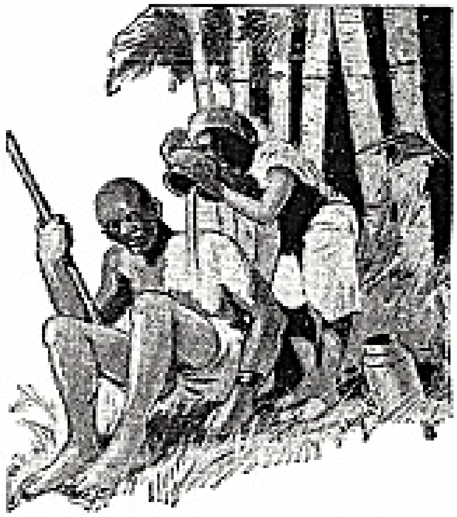


Liquid fire was used centuries before the World War. At the time of the Byzantine Greeks, warring nations used a composition of naphtha, sulphur and nitre, shooting it at the enemy through copper tubes.—Sherman Perr, Newark, New Jersey.

The muscle fibers in the average human body would be long enough, if placed end to end, to encircle the globe three to four times.—George Bumford, Jr., Amesbury, Massachusetts.



Natives of the Congo region process rubber by pouring the milk on their bodies for drying. — Kenneth Digre, Grenora, North Dakota.

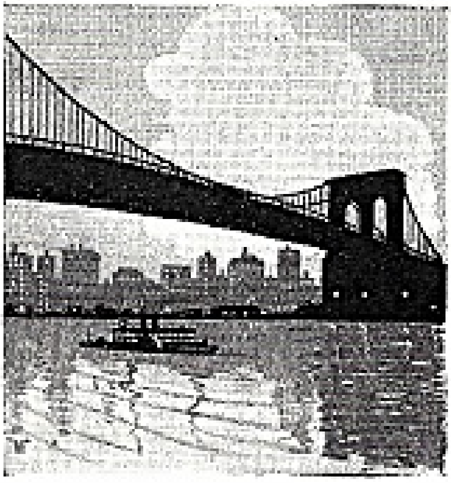


Wood's metal melts at 60.5 Centigrade, though all of the metals of which it is composed melt at higher temperatures.—Camen Paynter, Plankinton, South Dakota.

The side of the earth towards the sun moves faster around the sun than the side of the earth away from it.—Charles Clement, Cornelia, Georgia.

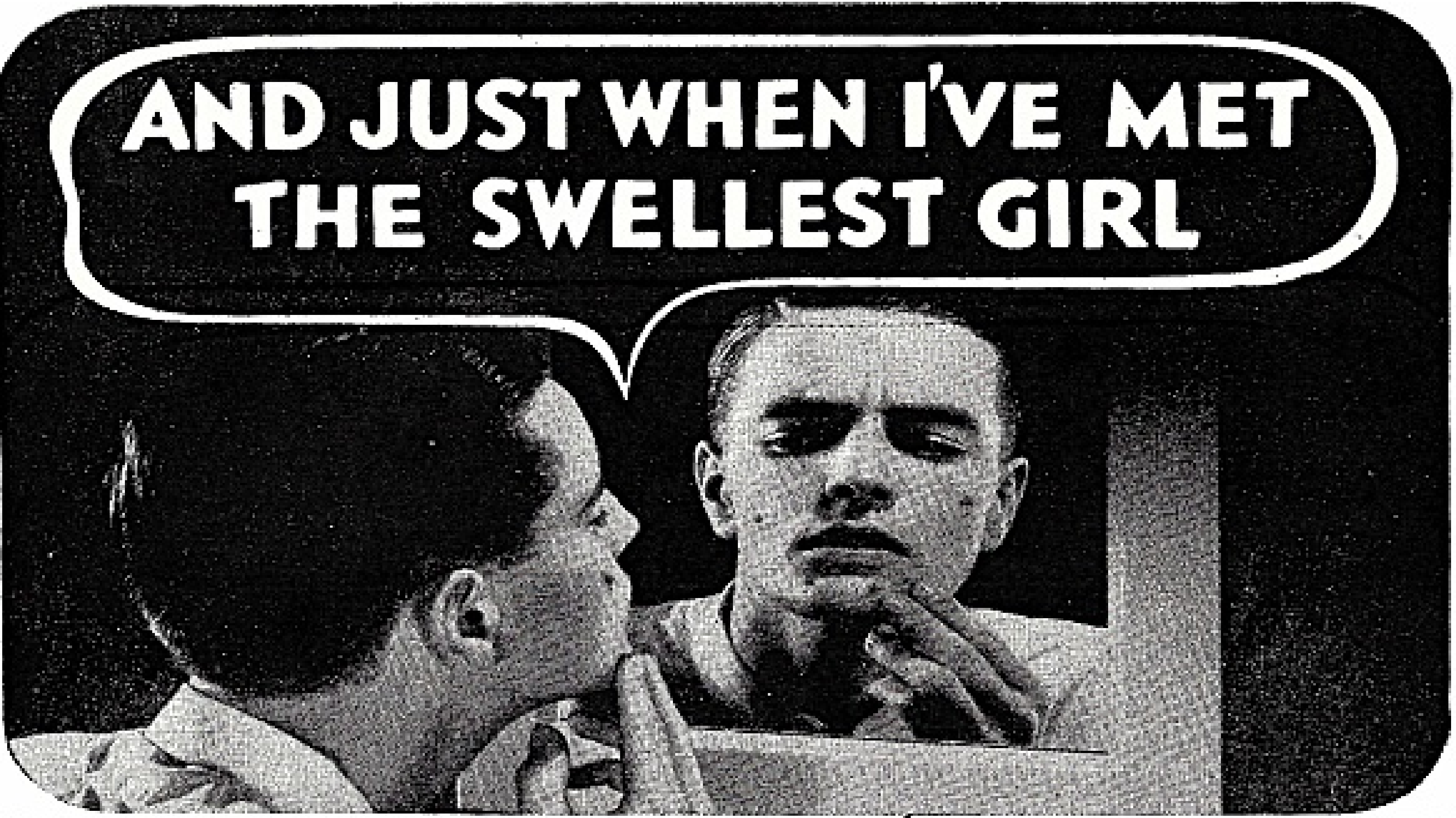
New York has 39,509 elevators which carry 15,000,000 passengers and travel 120,000 miles up and down every day.

When too much butyl acetate, a liquid used in making lacquer, is inhaled, one's arms feel and act a foot longer than normal.—P. H. Faucett, Los Angeles, Cal.

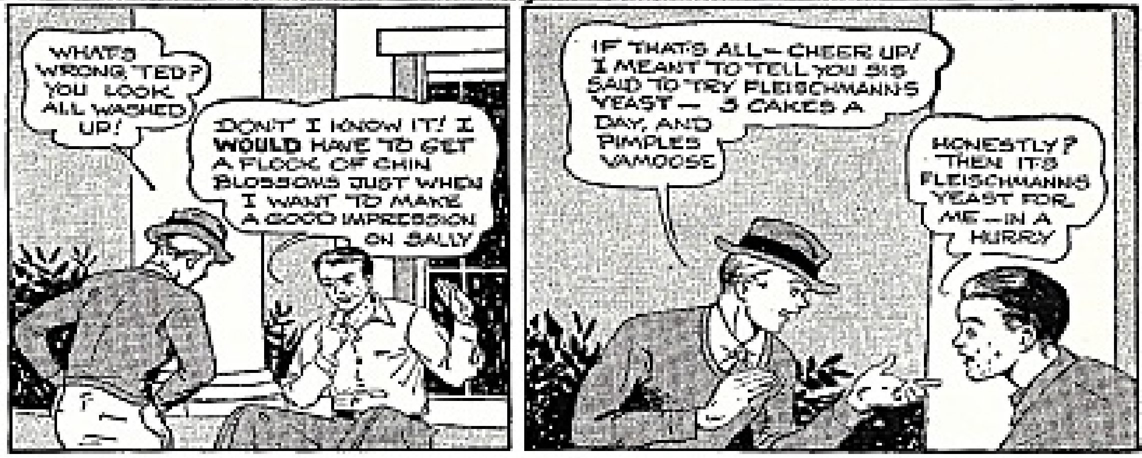


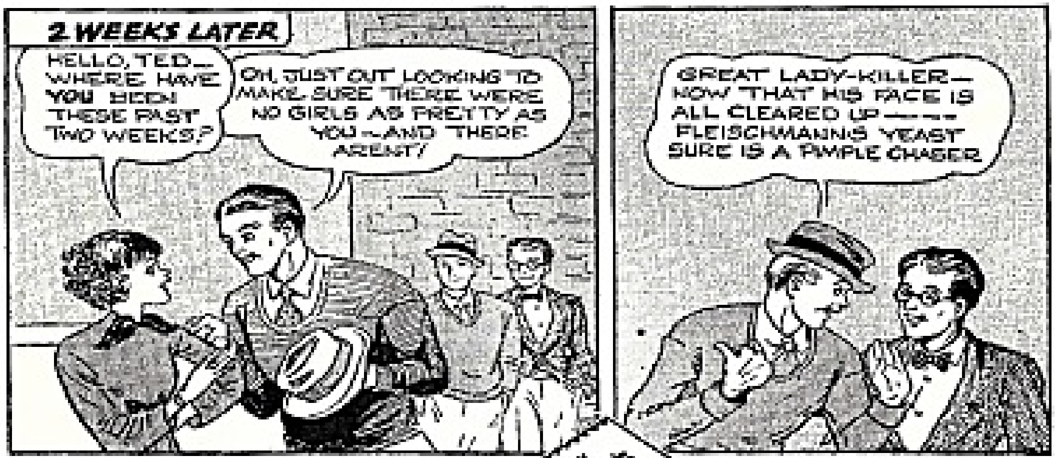
The center of Brooklyn bridge is three feet lower in summer than in winter. The distance between the supporting towers remains the same, but as the cables expand in the heat, the bridge sags.—Robert Curtis, Bay City, Texas.

One dollar will be paid on publication for every Paragraph Oddity accepted. State source or proof. Do not include Oddities with contributions or letters for other departments. No items will be returned.


AND JUST WHEN I'VE MET THE SWELLEST GIRL

A new crop of pimples was always taking the joy out of things!


WHAT'S WRONG, TED? YOU LOOK ALL WASHED UP!
DON'T I KNOW IT! I **WOULD** HAVE TO GET A FLOCK OF CHIN BLOSSOMS JUST WHEN I WANT TO MAKE A GOOD IMPRESSION ON SALLY
IF THAT'S ALL—CHEER UP! I MEANT TO TELL YOU SIS SAID TO TRY FLEISCHMANN'S YEAST— 3 CAKES A DAY, AND PIMPLES VAMOOSE
HONESTLY? THEN IT'S FLEISCHMANN'S YEAST FOR ME—IN A HURRY


2 WEEKS LATER
HELLO, TED— WHERE HAVE **YOU** BEEN THESE PAST TWO WEEKS?
OH, JUST OUT LOOKING TO MAKE SURE THERE WERE NO GIRLS AS PRETTY AS YOU—AND THERE AREN'T!
GREAT LADY-KILLER— NOW THAT HIS FACE IS ALL CLEARED UP—— FLEISCHMANN'S YEAST SURE IS A PIMPLE CHASER

Don't let adolescent pimples spoil any of YOUR dates!

From about 13 to 25 years of age, important glands develop, causing disturbances throughout the body. Waste poisons enter the blood. These irritate the skin, cause pimples. Doctors prescribe Fleischmann's Yeast for adolescent pimples. It clears skin irritants out of the blood—and pimples disappear. Eat 3 cakes a day until your skin clears.

FLEISCHMANN'S
YEAST

—clears the skin

by clearing skin irritants out of the blood

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How to Guard Your Dog's Health

[*Continued from page* 61]

proper feeding. Apply a standard eczema remedy and change the dog's diet.

Fleas and lice make life miserable for the dog. They are the cause of serious skin troubles and carry worm eggs. Disinfect the kennel; wash the dog with prepared soap; and use powder liberally on dog and bedding.

Distemper is the most dreaded disease of any and requires the utmost in care and careful nursing. Distemper is likened to a severe case of influenza in humans. The dog may have a slight cough and a rise in temperature. In later stages a discharge from the nose and eyes may appear. Dogs usually seek dark corners because of the weakness of the eyes. To prevent the disease, vaccine treatments from a veterinarian are a good investment.

In giving pills or capsules to the dog, put him in a sitting position, preferably in a corner. Grasp the upper jaw with the left hand and open the dog's mouth by gently pressing his lips against the teeth. With the pill held between first and second fingers of the right hand push it down into the throat. Quickly close the mouth and hold jaws closed meanwhile rubbing the throat until dog swallows the pill.

Liquids may be given by teaspoon, medicine dropper or small bottle by holding the jaws closed with one hand and slowly pouring the medicine with the other hand through the side of the mouth. There is an open space back of the last molar, that is convenient for pouring medicine into a dog's mouth.

One remedy, now on the market, comes in a tube. It is spread on the nose of the dog which licks it off and swallows it.

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

THE RED Australia 2d Jubilee is the prettiest and most distinctive of all Jubilees. Only on Australian Jubilees is the king shown riding a horse, a truly majestic figure. We offer this beauty together with the 1½ penny English Jubilee, the complete set (3 values) Japanese Commemorative issue of 1926, the complete set (6 values) of Denmark's beautiful Viking ships, complete set Italian issue 1908 (5 values) all for 10c to approval applicants. Globus Stamp Co., 268 4th Ave., Dept. 150, New York, N. Y.

SUPER-WONDER Packet Offered, containing 60 different stamps from Ethiopia, Brunei, Transjordania, North Borneo, Zanzibar, Sudan, Macao, Iraq, Charkhari, French and British Colonies, including natives, beasts, ships, etc. (No Europe), all for 10c to approval applicants. Big illustrated lists included. Kent Stamp Company, Box 87Z, Brooklyn, N. Y.

YOU'VE tried the rest—now get the best! "Challenge Collection," including Cape Goodhope, Triangle, Thessaly Octagonal, Commemoratives—10c with approvals. Free Airmail Collection, additional premiums given regular customers. Bargain Stamp Service, 905 West Fifth, Los Angeles, California.

50 DIFFERENT Stamps cataloging over $1.00 only a dime to approval applicants. 20,000 different stamps at prices ranging from 1c. All stamps guaranteed genuine. A fine selection of U. S. revenues at 1c and up. Address F. G. Stein, Dept. 214, 7360 N. Seeley Ave., Chicago.

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PACKET 25 Stamps, including Seychelles No. 1, Australia's Black Swan, Hejaz, animals, large pictorials—10c to approval applicants. We give FREE with above a mint copy Lindbergh's Cat Airpost of Spain. H. E. Dickinson, 534 West 11th St., Long Beach, Calif.

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[*Continued from page* 112]

layer. Place them in the form of a pinwheel, heads together, and bend them in until they parallel the bark.

You are now ready to fill the wound with concrete. The mixture should consist of two parts sand and one of cement. Make a very dry mix, only moist enough to stand; push it into the cavity through the nails by hand, pressing firmly to make sure the concrete reaches the most distant points. With a small trowel, round the plug out in an oval form, leaving its edges flush with the wood.

Finally, when the concrete dries, cover to a depth of $\frac{1}{10}$-inch with a watery emulsion of asphalt. This is a mixture of asphalt and clay, which can be obtained from any supply house.

Common tree ailments which may be cured easily are sunburn and bark bound limbs and trunks.

To prevent burning, whitewash limbs exposed directly to the sun. Should the tree sunburn before receiving this care, scale off the burned area with a chisel and hammer; or, should the cambium layer be burned through to the wood, cut out the entire thickness over the affected area. In both cases, cover the wound with the asphalt emulsion.

Inadequate circulation and exposure to the sun may cause a tree to become barkbound. Cure is simple and quick: Run a sharp knife or razor with the grain of the bark, cutting through to wood. By thus loosening the cambium layer, the bark again expands and circulation is restored.

"Crooked" Teeth—a Problem

[*Continued from page* 81]

An orthodontist; the dentist who specializes in "straightening" "crooked" teeth, makes good use of bones' peculiar trait of melting away under continuous pressure. When John comes to him with buck teeth standing out, and the other teeth crowded out of line, the doctor cements a band on each of the two big double teeth just back of the corners of John's smile; from these he extends a spring wire around the inside of all of the teeth. The circle on which these teeth stand is too small to accommodate them; so the spring-tension wire is a little too large and presses outward in all directions.

The spring wire pushes the teeth over against one side of their sockets; the osteoclasts on that side of each socket set to work removing the bone; and each tooth moves over to a new position. Then another brand of cells, known as osteoblasts, or bone builders, build up new bone in the wake of the

[*Continued on page* 130]

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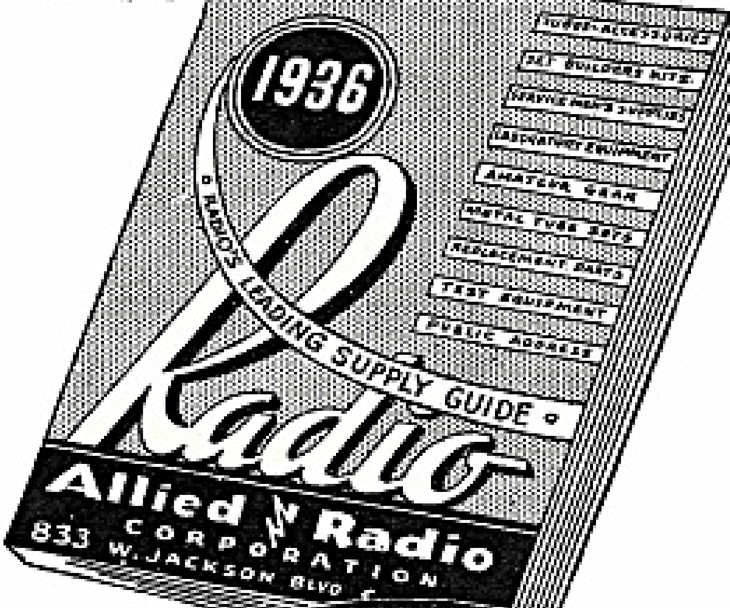

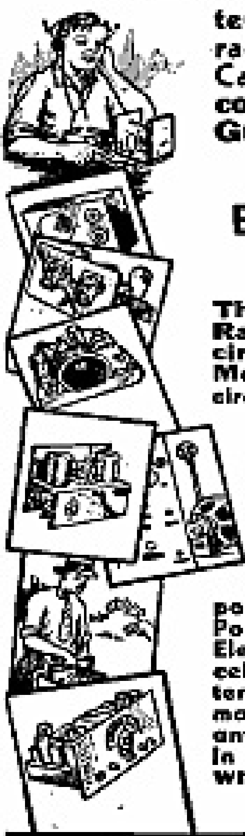

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Matching Wits With Wily Pheasant

[*Continued from page* 71]

water without being seen; then, in a leisurely strut, he heads into a sunny glade or meadow for a morning sun-bath before going into the fields for breakfast. The rest of the day is spent in feeding as illustrated on page 71.

Driving a cornfield is primarily a group project unless dogs are used. (See diagram.) Contrary to common belief, the drive through the field should not be hurried. Until about fifty yards from the end of the field, the hunters should merely amble along. Coaxed along by a feeling of false security, the game will run easily ahead. But near the end, at a prearranged signal, the drive should change to a rush, and the frantic pheasants, taken by surprise, run forward to find themselves crouching in the open.

Don't Shoot Along Ground

At no time during a drive shall a hunter shoot along the ground, lest he wound a dog or an invisible hunting companion.

Almost any pheasant hunter will swear that pheasants cannot be flushed from a slough bed without the aid of a dog. But a pheasant will flush if he is sure that the hunter sees him. Thus evolved what might be called a "hesitation" drive, with the hunter walking leisurely through the grass and stopping completely—with gun at "ready"—about every twenty yards to peer sharply into the grass around him. And nearby pheasants, sure that they have been seen, boil into the air in a bold attempt at escape.

Pheasants Are Slow Fliers

Experienced shooters seldom lead a pheasant except on a side shot or under unusual wind conditions. For the pheasant is not a fast flying bird in spite of the tremendous racket he kicks us. Most of its speed is generated in the fast initial leap from the ground. This leap, plus the loud whirring of the short wings as they lift the heavy body, lends a mistaken impression of speed, often hurrying the shooter to a consequent miss as the pattern of shot has no chance to spread on a close shot. Even oldtimers fall victim to this mistake. All shots should be aimed at the head, as the vital organs are located well forward. (See diagram.)

In the matter of guns, the hunter may make his choice. A .410 guage shooting size six shot has killing force. While this is extreme and requires high shooting accuracy, hunters are inclined to favor the lighter guns with the subsequent rise in favor of the sixteen guage and the high popularity of the 20 guage.

But whatever the gun, whatever the shot, remember the main things in hunting pheasants are following the bird's movements and using effective methods of flushing them.

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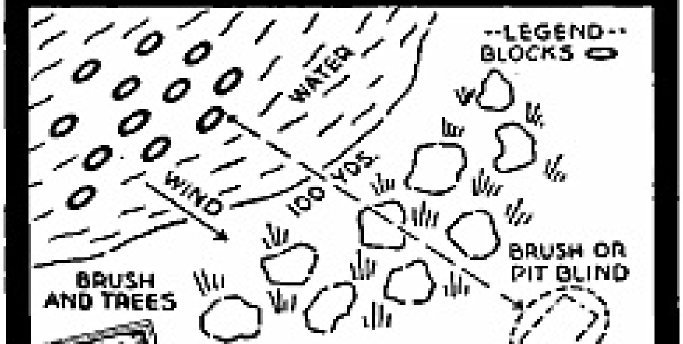

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Talk Your Ducks Into the Bag

[*Continued from page* 69]

just one quack given with a second or two between each call. The chuckle is a "tickled all over" call, and varies from chattering to chuckling. This is given as an incoming flock lands in the water after being lured there by the sight of the decoys and the feeding call.

The first call to give is the greeting in a slow, loud tone. If they respond, you change quickly from that to the feed calls, lazy hen, and lonesome calls, mixing them up leisurely. Then as the ducks come closer, the calls should become more excited, always, however, being ready to turn loose the comeback call should the end ducks offer to go elsewhere. If the end duck does turn, the caller should become highly talkative on his comeback call, making certain that there is a plaintive, pleading ring on the top notes. After the ducks have landed, it is time for the chuckle call.

Ducks Talk Like Humans

The exact tones to be used can be taught only by the ducks themselves. In this respect, however, one thoroughly familiar with the scale on his duck call can duplicate the efforts of the ducks after hearing them only once. Then too, because the duck's cries of excitement, joy, contentment, lonesomeness, and welcome are so strikingly human, one needs no lessons in that respect.

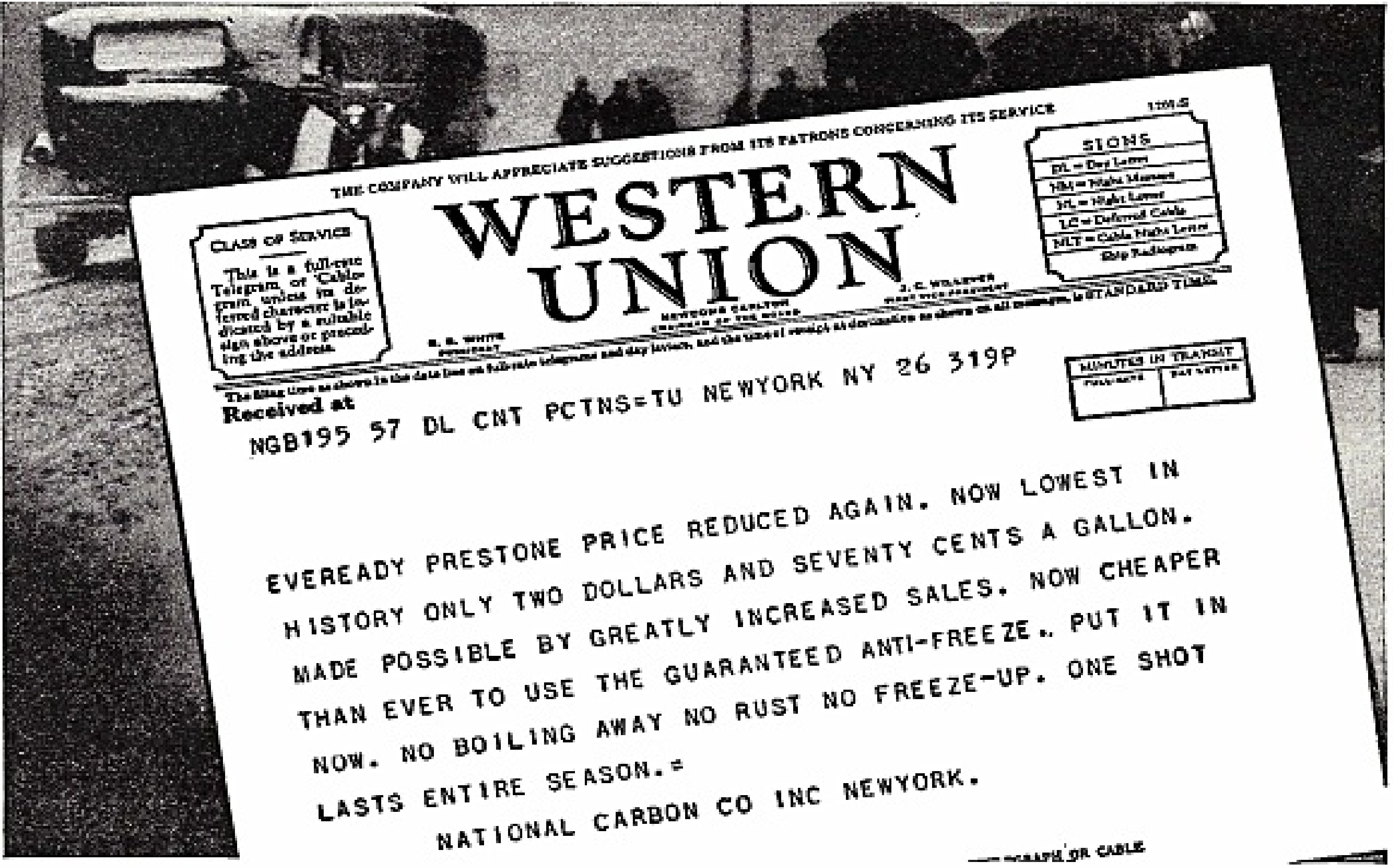
The sport of luring the ducks up to the blind offers as much enjoyment as actually getting the duck. Once you have won your victory and have the ducks within range, a little head work will change things to the advantage of the hunter as shown in diagram on page 68.

When a large flock of 40 or 50 ducks comes whirring up to the decoys, it usually comes up in rows four or five deep, with the leaders in the front row. If the hunter allows the leader to come in close and then drops a bird in the rear rank, the leaders, flying away from the falling duck, will climb right over the blind. Then comes the time for action.

Skill Needed for Lake Ducks

Lake and diver ducks, such as the bluegills, ringbills, canvas backs and redheads are much harder birds to handle with decoys and duck call. If the ducks come within range on the first swing, it is best to open fire, as the chances for a second swing are none too good.

This year the federal government is having a thirty-day season with a daily bag limit of ten ducks, and a limit of ten ducks in possession. It is an excellent time, then, to put a little more emphasis on the art of duck hunting and a little less on the art of duck shooting. One duck well earned gives more satisfaction than ten shot down at random.



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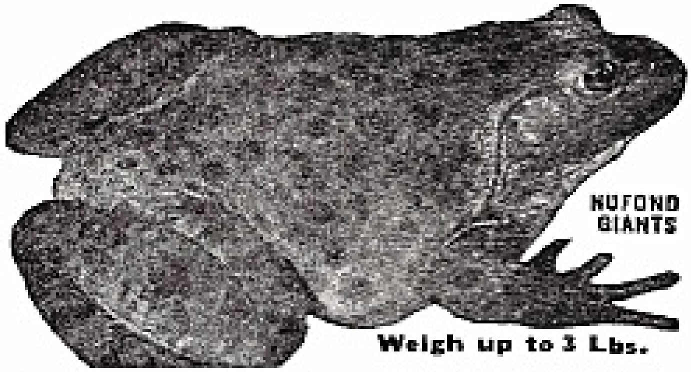

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"Tiny Tom"—Model Locomotive

[*Continued from page* 99]

the center of the hole $\frac{3}{16}$" above the bottom of the firebox (Fig. 9). This will line the shaft up correctly.

Next the axles are cut on the lathe. The drive wheels are of grey cast iron. A list of manufacturers selling the wheels and other parts can be obtained by sending a stamped addressed envelope to Modern Mechanix Publishing Co. The drive wheels are chucked in a universal chuck, faced right down until another cut would run into the front side of the spokes. Then the 1" face is turned to diameter and the $\frac{1}{32}$" flange turned out. The wheels are finished to $\frac{3}{32}$" thickness. Next an undersize 1/8" drill is chucked in the tail stock and the axle hole drilled. The crank throw holes are drilled $\frac{3}{16}$" off center in the counter balance provided for the crank pins. Drill these $\frac{1}{16}$".

Now put the motor shaft in with the small pinion on it. Solder the collars and pinion in place so that there is just a hair of play forwards and backwards. See that the end of the shaft is slightly rounded to serve as a thrust against the boiler.

Then put in the axle through the large worm pinion. When the axle is centered, touch a bead of solder to the worm, the bushing and the axle to lock it in place. Then put on the wheels, punching the center of the axles with a center punch to lock them in place temporarily.

The cross heads (Fig. 10) are simple brass squares 1/8" thick with grooves in them for the $\frac{1}{32}$" cross head guides. They are drilled for $\frac{1}{16}$" holes, into which heads of 4 penny shingle nails, clipped to correct length, are driven.

Care must be taken to get the distance between the crank pins on the rear and forward wheels the same on both sides, or the model will bind. The front wheels are link driven just as in a large locomotive, and after being quartered they should work smoothly. Quartering will be described in Part II.

Next month construction of the locomotive will be completed before taking up the description of the tender.

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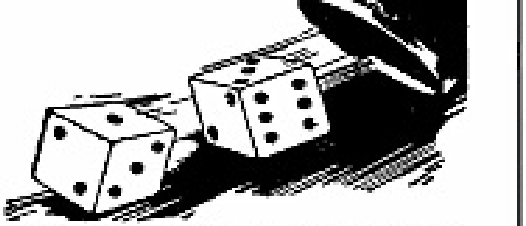
Blueprints for building "Tiny Tom," 00 gauge locomotive and tender, can be obtained now for $3.00. These blueprints contain all drawings and instructions of the three part article. Blueprints for an 00 gauge passenger coach at 25 cents and for model railroad equipment, including turntable, drawbridge, semaphore signal and crossing gate, all on one blueprint for 25 cents, are also available. Send money order to MODERN MECHANIX PUBLISHING CO., Minneapolis, Minn.



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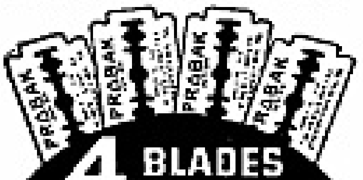

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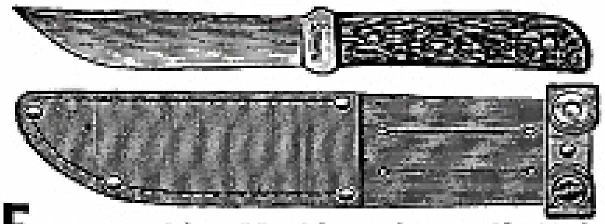

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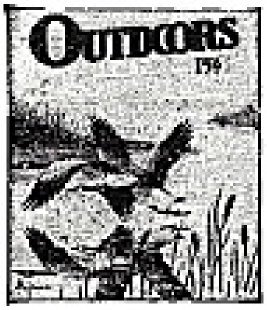

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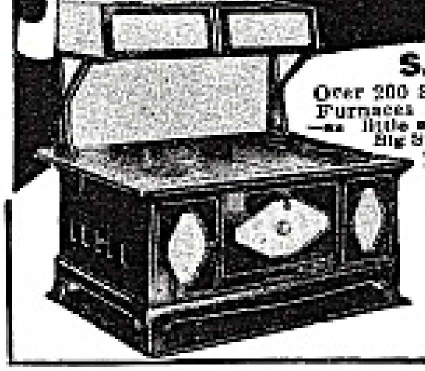

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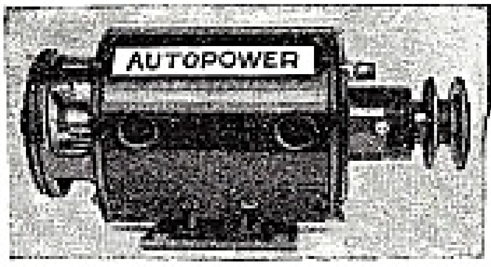

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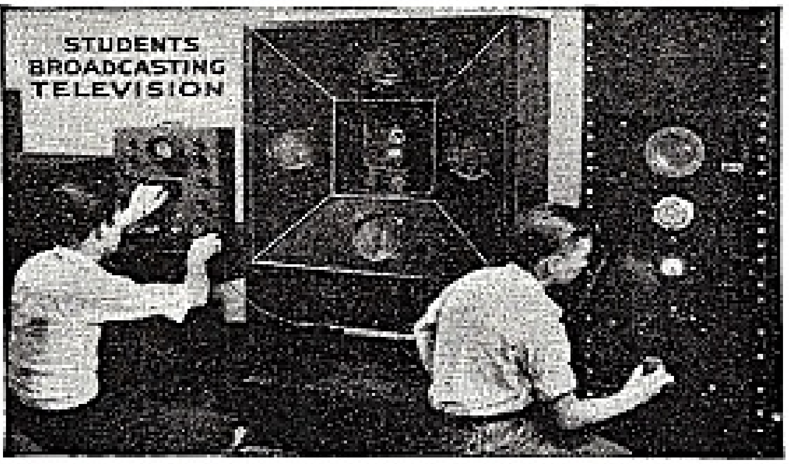

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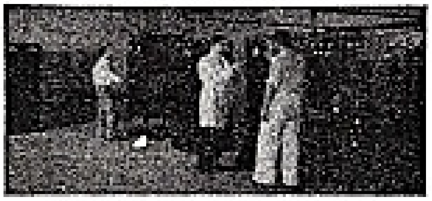

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Boy Genius Builds Electric Lab

[*Continued from page* 88]

fingers. Scores of second-hand books, filling the shelves at the rear of the laboratory, make up a complete university science library. Just across the room are more shelves, lined with bottles of chemicals, flasks, and chemical apparatus.

While delving into advanced chemistry, Franklin has built his own carbon arc furnaces.

"The trouble with my furnaces," he complained, "is that they even melt the clay, asbestos and plaster of Paris mixture which I use to make the electrode supports. I have to make a new furnace every week."

The young scientist is quiet, unassuming, but with an inquisitive turn of mind. Research is his chief interest, but long hikes through the countryside and experiments with tree-grafting are other hobbies.

"What subjects are you particularly interested in, Franklin?" he was once asked.

"Research," was the quick reply. "I like to try experiments to see if they will work. If they don't, I keep at them. All science interests me. When I tire of one subject I can turn to another."

Mediumistic Tricks for Hallowe'en

[*Continued from page* 107]

and hands it to you. You take it and spread it unconcernedly on the table before you (over the heated spot). Before his eyes, without a movement from yourself, the message ghostily begins to form and appear.

To produce spirit messages on slate, wipe a small slate with a damp sponge, then hand it to a guest for inspection. Place the slate on a table, and about three minutes later turn it over to show the spirit message.

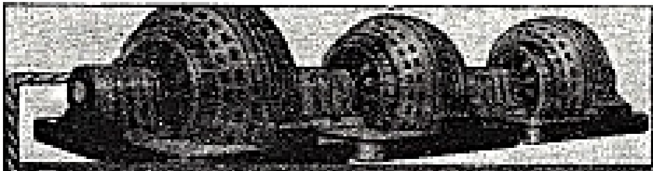
The words are *scratched* on the slate with a rounded piece of glass, water obliterating them temporarily.

To receive spirit writings out of the air, seat the subject with his back to a pair of black drapes. Hand a plain slate to the subject, asking him to write a question on it while your back is turned.

Without turning, order the guest to raise the slate above his head, message side down. Facing about, reach up, apparently take the slate, and hold it behind you without looking at it. Beseech aid from the spirit world for a minute or two, then step forward as though to replace the slate in the subject's hands, still above his head. The subject feels the slate placed in his hand, and lowers them. There, on the opposite side from the question, is the answer.

The "spirit" is hiding behind the curtain.

[*Continued on page* 138]



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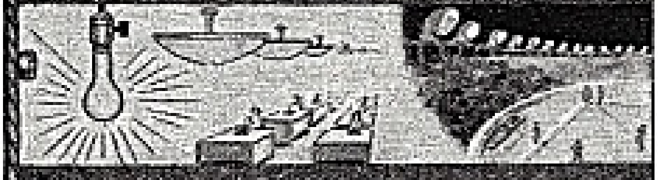

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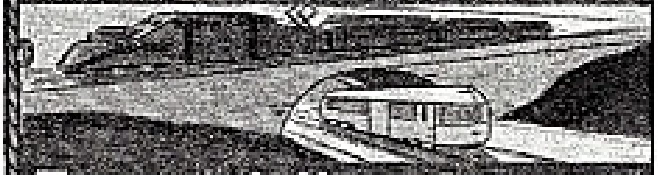

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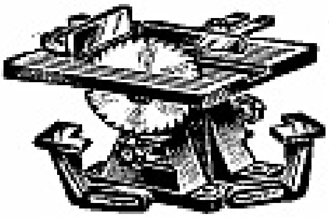

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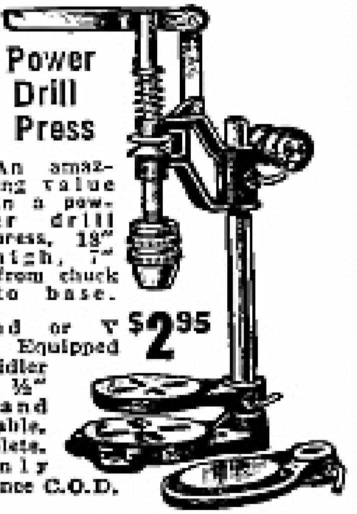

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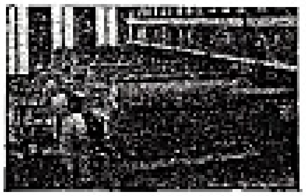

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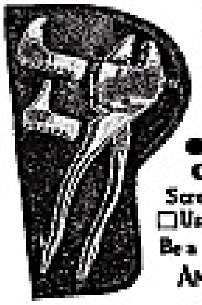

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Arranged Slides Are Jewels

[*Continued from page* 59]

companying illustrations. Select the materials to be used, the pattern to be followed, and then draw this pattern in enlarged, diagram form, placing this sketch where it may readily be consulted during the actual mounting. On the drawing, indicate by symbols the objects to be placed at the various points.

Supposing we begin by taking butterfly wing scales to make a six-pointed star.

Collect a number of different kinds of scales from various portions of the wings, inspect under the microscope, and pick out interesting types. If these scales are very small and the arranged design intricate, all work will have to be done under the microscope.

The wing scales must be thoroughly dehydrated in alcohol and cleared in xylol—five minutes in each. Then take up a single scale by touching it with the tip of a toothpick. As each scale is arranged, touch it with a tiny drop of balsam applied with a toothpick. When all are in place, dry the slide in a dust-proof box, then add sufficient more balsam and gently lower the cover glass into position. Dry carefully until all danger of the objects drifting about in the balsam is past.

"Crooked" Teeth—a Problem

[*Continued from page* 120]

moving tooth. A wire must be kept on until the new bone is hard enough to hold the teeth. And the pressure of leaning or sleeping habits must be stopped.

A spring wire exerts pressure at both of its ends. Attach its ends to two teeth of equal size and both will move equally. So the orthodontist often "gangs up" two or three husky teeth at one end of the wire so that end can't move; he then pits the force against one or two weaker teeth at the other end, so *they* will do the moving.

A California orthodontist has invented a new orthodontic appliance whose tooth-band brackets have two slots instead of one. Into one slot he inserts a tiny round wire, not much larger than a horse hair; this wire tilts the roots of the teeth to one side or the other.

Into the other slot, the orthodontist springs a small ribbon shaped wire, which tilts the teeth roots outward toward the lips or inward toward the tongue. Both wires work together in expanding the dental arch—the circle on which the teeth are placed.

The tiny round wire may be applied first, until the teeth are accustomed to the gentle pressure; then the second wire is added.

Each tiny wire is bent to a shape which would fit the line of the teeth as they should be; it is sprung into brackets on misplaced teeth, and slowly moves teeth into line.

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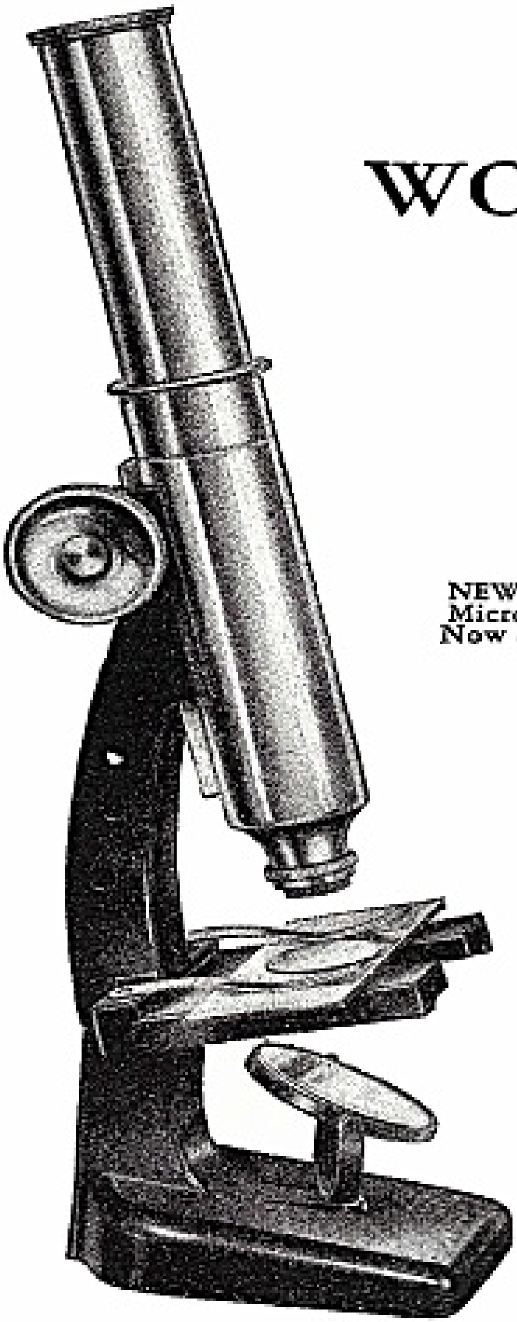

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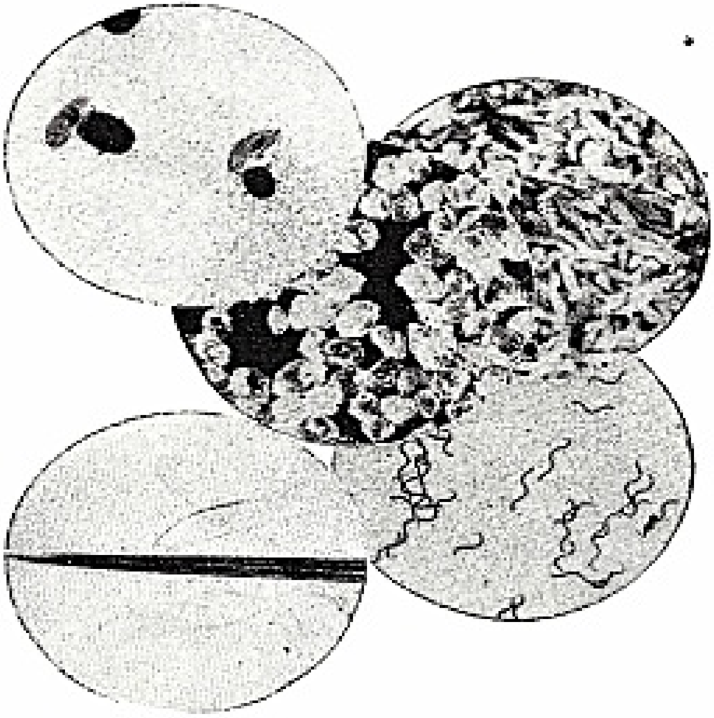

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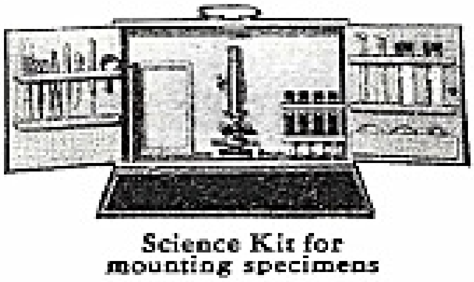

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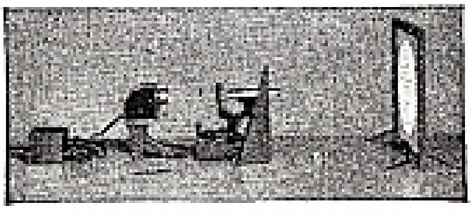

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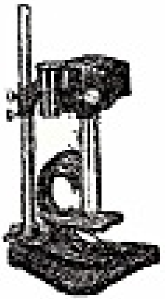

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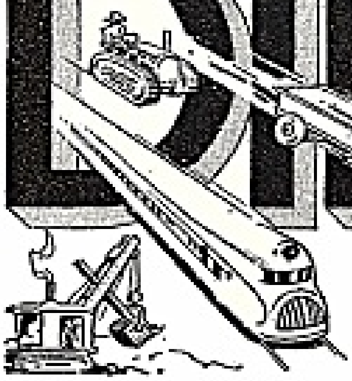

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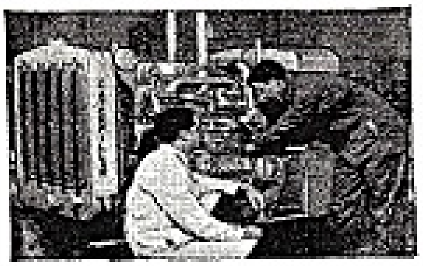

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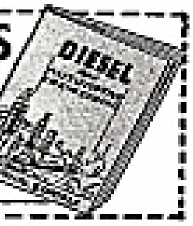

Secrets of Championship Football

[*Continued from page 39*]

team has possession of the ball and each time our quarterback punts on second down.

What would any person between halves tell such a team that had followed instructions so carefully that first half? Probably what I would: To keep their shirts on, turn on the ground gaining power gradually and make at least two touchdowns. Chances are, I probably would continue, the opponents, following their driving play, are tired and won't be able to continue the pace.

Our quarterback continues sparring around in the third quarter until the period is nearing its end. People in the stands probably are frantic, wondering when the team is going to find itself and get going—and frankly, we are a bit worried ourselves.

Then we punt from near our own goal line and the opponent quarterback gathers the ball in his arms and returns six yards before letting it slip when he is tackled. Our right guard comes up with the treasure.

Fumble! The Psychological Moment

The psychological moment! That's it, that is what our quarterback has been waiting for. All through the game he has been sizing up the opponent's line for vulnerable points and now, that a chance has come, he knows the right side offers a chance for gain. Too, the morale of the opponents is going to be affected somewhat by a fumbled punt at a critical spot.

The first play—the reverse (diagram 3), with the wing back taking the ball from the fullback who half spins. Four yards on that, and our quarterback's men keyed up to high pitch to keep going. It looks like another team now.

The next play (diagram 4) looks pretty much like the one preceding but the fullback really spins this time and drives between opponent's tackle and guard for nine yards to the 31 yard line—and the second first down of the game for our side.

A speedy lineup and the reverse comes again—this time with vicious blocking to clear the runner's path, and eight yards result.

Didn't we say our quarterback had a play for every point on the field? Here he is now on the opponent's 23 yard line—scoring territory—and possibly the game depending upon a quick score. His opponents are a bit panicky, he knows, and are tightening their defense to bolster up the weakening right side. Here is a spot for a fooler, we see him decide. Through his mind flashes too the vision of the hard work it took to perfect the play, (diagram 5).

[*Continued on page 134*]

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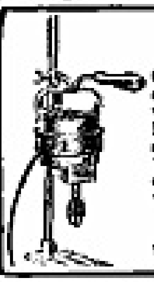

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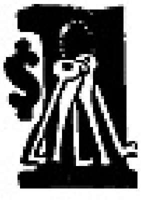

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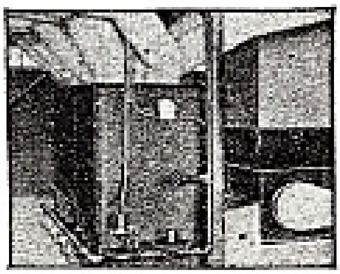

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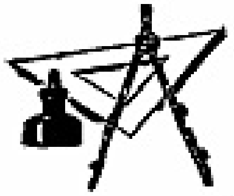

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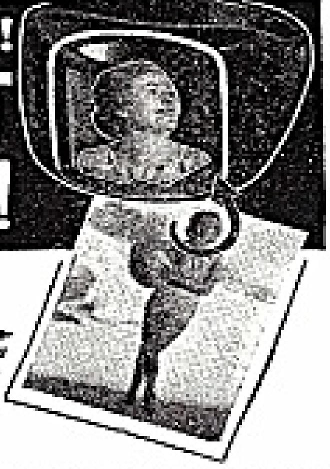

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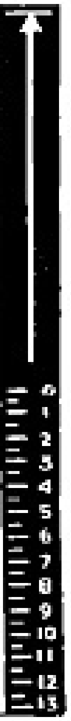

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Secrets of Championship Football

[Continued from page 132]

The fullback spins as if to smash the line again. Instead, he hands the ball to number 3 as he passes him. Number 3 in turn tosses a lateral pass to number 1 who has faded out to the left. Number 11, meanwhile, has drifted down the field back of the secondary and stands near the sidelines, five yards from the goal. Spying him, number 1 lets go with a perfect forward pass. Number 11 gathers it in and falls over the goal line. The goal is kicked now and the score is tied again—and possibly victory lies ahead.

The opponents kick off now and we try two plays without great success before the quarter ends. The last period opening, an exchange of punts finds our quarterback now taking a long kick on his 30 yard line. He manages, by masterful running, to go 15 yards.

Our fullback, driving like a mastodon now, goes through on a straight buck (diagram 6) for four yards and a halfback follows with a reverse for eight more. Our quarterback still has that weak right side in mind.

He punctures it now, the hole opening up for the fullback on a spinner like a mowing machine had been used. The first man the fullback hits is the defensive half and he bowls him over like he is made of paper. The opponent fullback tries, too, and is stiff-armed off and likewise the defensive quarterback. The opponent left half, however, who cuts across the field brings down our fullback from behind, 24 yards from the goal line.

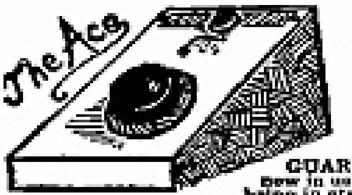
Uses Running Game

Scoring territory again. The running game is working now, though, and the score is tied. Our quarterback knows it isn't time to take the air or try a trick play involving multiple handling of the ball.

He uses the reverse instead and then sends the big fullback into the line again. Eight yards on these and now three more on a slide off tackle and the ball rests 13 yards from the wide white stripe, midway between the right side line and the middle of the field.

The speedy right half is called on now. He takes the ball on the reverse and brilliant blocking swings him into the open. Then, by sheer speed, he beats the secondary defense to the left hand corner of the field and slides over for a touchdown.

Fighting a battle on a real battle field isn't so very different in some respects from a tussle like this on a football field. To win, a fighting force must either break through or flank an enemy while weakening his morale with air attacks and shell fire. Using essentials that correspond to these, football teams move up the field—and even a Napoleon could learn a few things possibly from a first rate field general like our quarterback.



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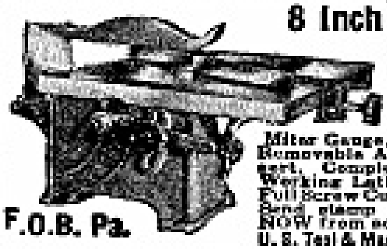

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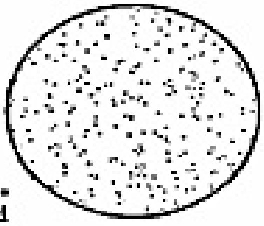

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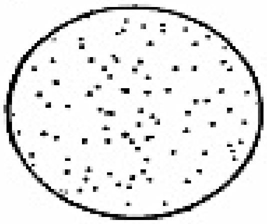

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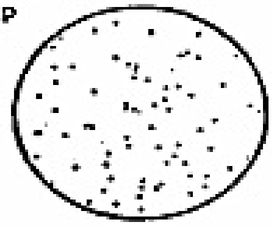

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Jimmy Doolittle—On Aviation

[*Continued from page* 48]

outings—for recreation rather than an essential in his daily life.

Q. How popular do you think commercial aviation will become?

A. If you want to fly from here to Mexico City, you call up the office down here two weeks in advance and you may get reservations if you're lucky. Is that popularity?

Q. How about the Diesel engine in future aviation?

A. The Diesel engine is inherently about 30% heavier per horse power than the conventional four cycle gasoline engine. It will have its place in *long flights,* where it is bound to come into its own.

Q. Just why is that true?

A. For a given weight of fuel, the Diesel goes farther. On long distance flights—the Pacific, Atlantic, trans-continental—it's not so much a question of engine weight as it is of fuel weight. The greater amount of fuel needed for these flights makes the engine look mighty small by comparison. But I don't think the Diesel will ever become popular for short trips.

Q. What would you say as to the advances in safety in aviation in the last few years?

A. Remarkable progress. While the other methods of transportation get more hazardous with added speed, planes have been adding another safety factor every time they add a mile an hour.

Q. Do you think that planes will become as safe for the average person to fly as cars are to drive?

A. The time will soon be here when the only question about whether the average man can own a plane will be, can he afford it? And with thousand dollar planes—there'll soon be a lot of average fellows owning and flying them.

Q. What part do you think aviation will play in the next war?

A. In the last war we had individual combat between planes—dog fights. The next war will be fought by air forces rather than by individual planes.

Q. How about the ground forces? What part will they play?

A. The next war will be a different one from the last. The principal job of the land forces will be to prepare bases for aircraft, and occupy and hold the ground that the air force takes.

Q. Generally speaking, then, you'd say that the future of aviation is . . .

A. Aviation is just at its start. There is more ahead for it than for anything else I know of. If you think it has grown fast in the past, *watch it now!*

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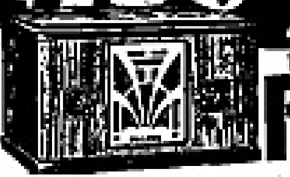

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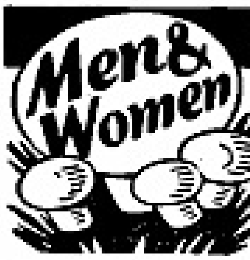

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Air Adventures of Radio Amateurs

[*Continued from page* 57]

in conversation with the operator at Alitak, more than 1,000 miles away. At lonely Lazy Bay on Kodiak Island, five-year-old Henry Loof lay near death with appendicitis.

Stevens described the little lad's symptoms to Dr. A. H. Seering of Harbor View hospital, Seattle. The physician diagnosed the case, gravely warned of the danger of peritonitis.

"I can't reach Anchorage because of bad weather," the Alitak amateur flashed back. "Please send a message to Anchorage for help," he pleaded.

Stevens called the United States Army Alaska Telegraph, which employs both wireless and cable, and the message was relayed through to Anchorage, a circuit of 2,000 miles. Pilot Harry Blunt at once took off through the storm with Dr. A. S. Walkowsky.

Late that afternoon they reached Lazy Bay, 400 miles from Anchorage. They were in time to save the boy's life.

There are nearly 40,000 radio amateurs in the United States alone. These amateurs are bonded together in the American Radio Relay League.

Mediumistic Tricks for Hallowe'en

[*Continued from page* 128]

When the subject raises the slate the first time, a hand reaches through the folds of the curtain, bearing a plain slate. The medium grabs *this* slate, and the "spirit" grabs the one held by the guest. He glances at the question, quickly scrawls an answer on the other side, and pushes the slate out through the curtain again. Another exchange completes the trick.

No "seance" is complete without a table-lifting demonstration.

Seat your friends across from you around a small, light table, and order them to rest their hands *lightly* on the top of the table as you are doing.

Sticks, thrust up your sleeves, are slid under the table edge to act as perfect levers in lifting and carrying the table about!

The common trick of joining hands is simple. Have the subject sit opposite you, and spread his hands on the table with the first and middle fingers of each hand, stroke the index fingers of the subject's hands, in an *absolutely dark* room.

After a moment, slip one hand away and, by spreading the fingers of the other hand, continue the motion, without breaking the rhythm. Gradually stop the rubbing, then pick up a paper horn previously placed on the table for the spirits, and whisper the message. Reverse the rubbing operation to get your hands back into position again.

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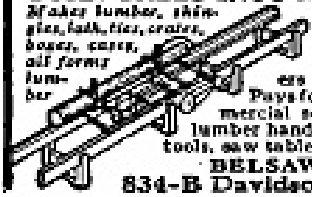

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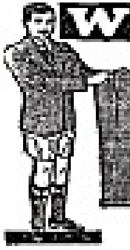

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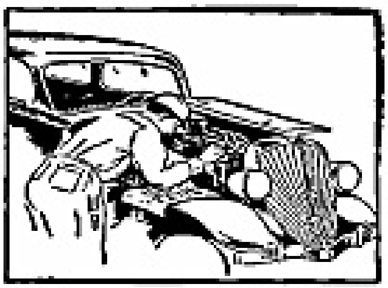

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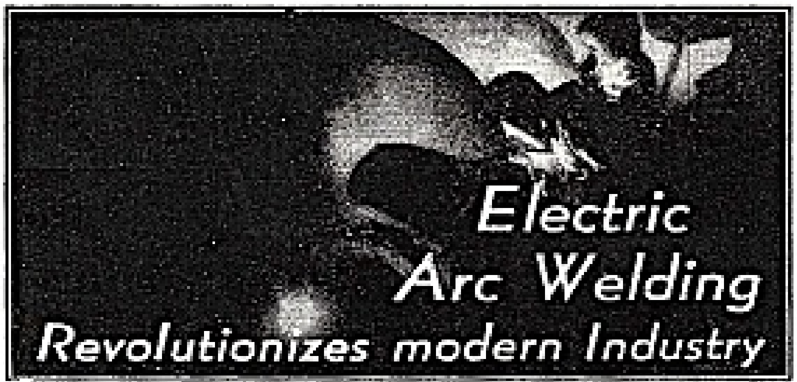

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Can Weapons Conquer Ethiopia?

[*Continued from page* 53]

back. The farther the Army advances the more precarious will this problem become. A sudden raid behind the main body of the army, cutting off its food and water supply for even a few days, would mean suffering and death to thousands.

"Hot Foot" Gas Debunked

Much has been made of Italy's threat to spread irritating gas on the ground over which the barefooted Ethiopian soldiers must pass. Such gasses, however, bar the immediate use of the contaminated ground to one side as much as the other; and since Italy is waging an offensive rather than a defensive war, it is the Italian troops which must advance to attain their objective. The slowly retreating Ethiopians could cause much more suffering by poisoning the few water holes as they fell back.

Italy has one of the most efficient air forces in the world, but aside from reconnaissance and the directing of artillery fire, there is little it can do.

It is true that Addis Ababa and Harar can be bombed, but they contain no vital industries, few important buildings, and are not great centers of communications. The bombing would be a nuisance, but of no military importance.

The machine-gunning and short-range bombing of massed troops by attack planes during an actual assault would be effective, as the Marines proved in Nicaragua; but air fields will have to be constructed rapidly as the Italian army advances.

Ethiopians Trained Night Raiders

An ambush by moonilght, such as the Ethiopians staged at the Adowa debacle, would prevent the effective use of this phase of aviation and the Ethiopians are likely to go in for night attacks, for the Italians must march at night if they hope to prevent excessive casualities from the terrific heat. Long practice in dawn slave raids have made Haille Selassie's warriors adept at night fighting.

An attempt to use tanks will be made at first, but as the interior uplands are approached only mules and men on foot can negotiate the rocky defiles.

Heavy artillery cannot be used effectively against an enemy who has no permanent fortifications, railheads, or ammunition dumps. Light mountain field pieces, machine guns, and efficient rifles will be the only effective superiority the Italian army will possess in armament.

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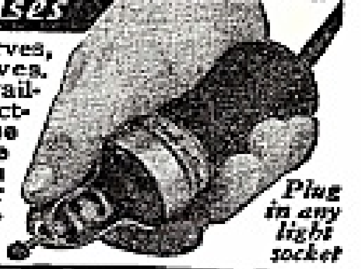

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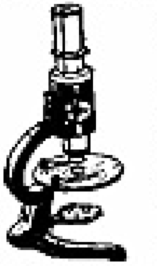

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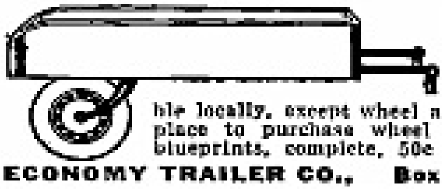

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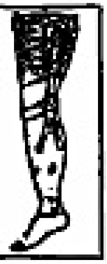

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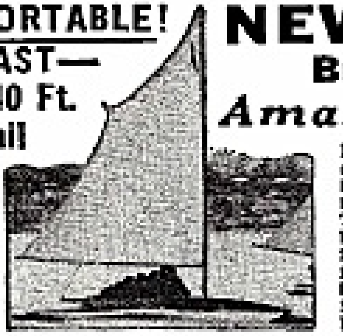

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Apply Your Mechanical Ability

[*Continued from page* 85]

a big problem that will bring a still bigger reward.

Many butcher shops now have tenderizing machines for the treatment of cheaper cuts of steaks. A considerable percentage is added to the cost of every pound of steak so treated. The housewife would like to have a machine for this purpose at home—something to replace the old-fashioned idea of beating the meat with a hammer. Millions of housewives would pay at least a dollar for such a device if it could be relied upon. The inventor of the device could get 15 cents out of every one of these dollars.

Painters now use blow torches and putty knives to remove paint. What is needed is an electrically driven paint remover that would not require the application of any heat and that would not injure the surface of the wood underneath the paint. Such a machine could sell for twenty-five or thirty dollars each, so eager would painters be to use it.

Gardeners have long been looking for a simple attachment that could be applied to any lawn mower and that would permit trimming around the edges of flower beds.

Measure Condensers With a Bridge

[*Continued from page* 92]

galvanometer so that the plane of the coil is in a north and south direction; this offsets the earth's magnetic field. Press the key, then find the point on the slide where contact with the wire does not affect the compass needle. Multiplying the resistance of the standard by the number on the scale where balance is obtained gives the unknown resistance. Use only one dry cell. Press the key first always, and do not hold key down any longer than necessary.

The buzzer and transformer are needed to measure capacity. The buzzer is adjusted to interrupt the circuit at as high a frequency as possible.

Connect standard and unknown capacities in the positions indicated in the diagram, press the key, then slide the contact prong along the wire until the point is found where the tone is very weak. If the dead or weak spot covers several divisions, estimate its center, then multiply the scale reading by the capacity of the standard.

Inductances are somewhat harder to measure. Place the rheostat in series with the unknown inductance, as in the circuit, and with the contact about in the center of the zone of least tone on the slide, vary the resistance until the tone is at minimum volume. Now readjust the slide wire contact, and again change the rheostat, until the balance is as sharp as possible.

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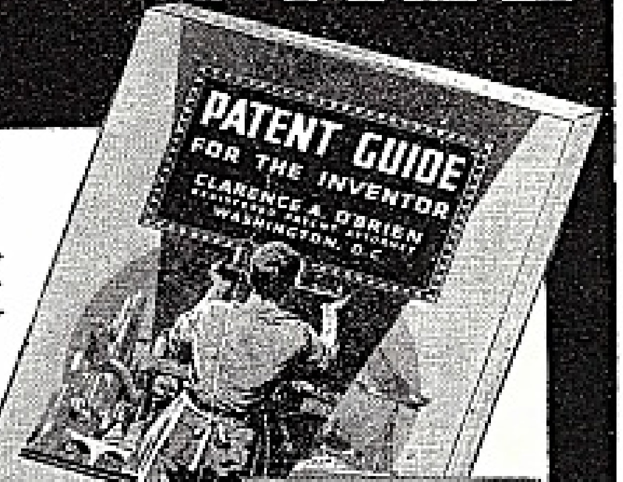

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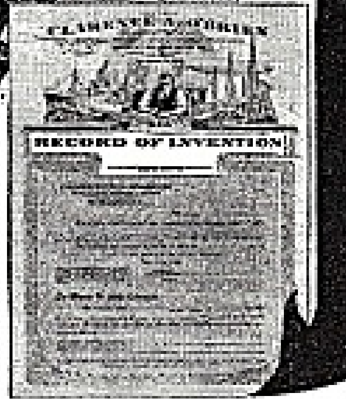
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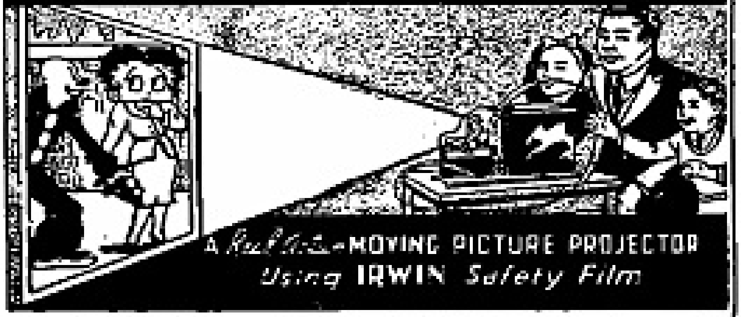

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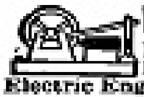

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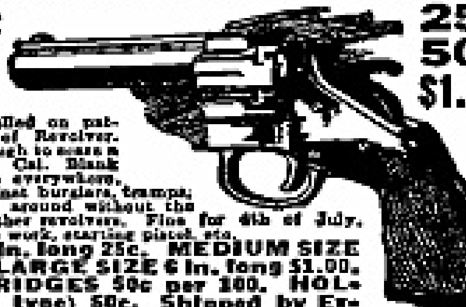

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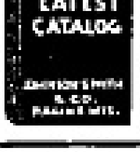
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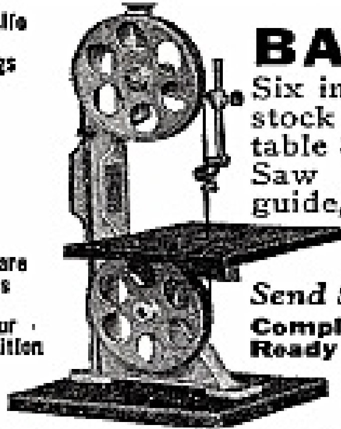

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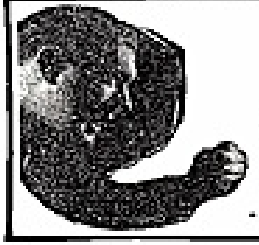

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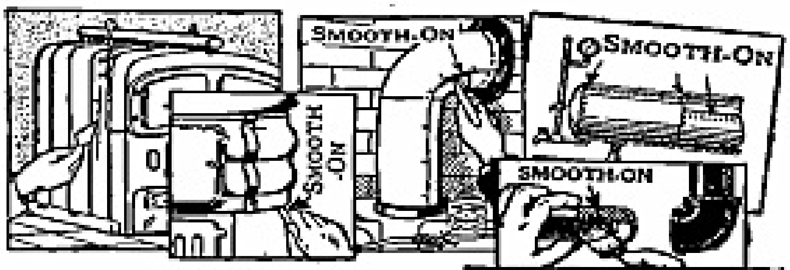

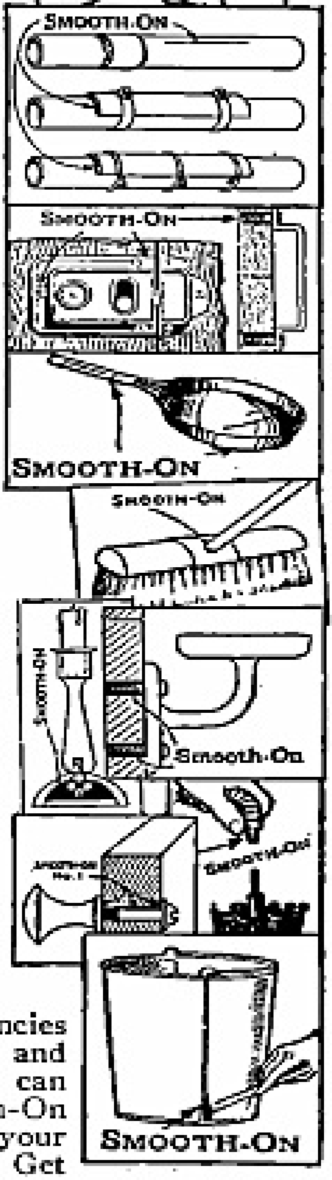

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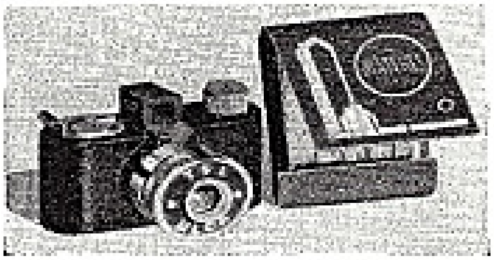

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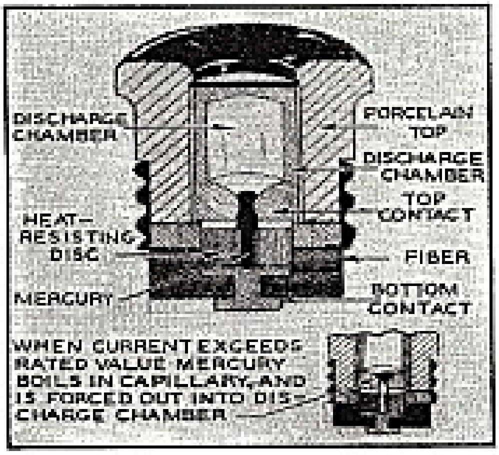

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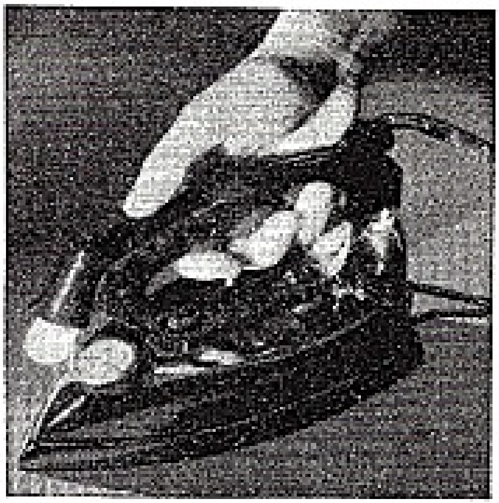

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PRACTICAL 200 Amp, welder built from old farm light plant. Small cash outlay. Gets the job done. Blueprints, specifications. $5.00. City Electric Shop, Snyder, Oklahoma.

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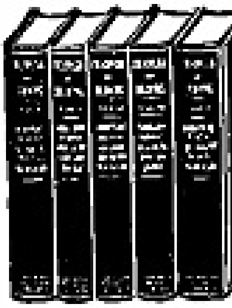

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Build your own bicycle trailer, wheelbarrow, scooter or coaster wagon with Musselman Doenut cord airplane type tires and wheels. We furnish the drawings. Haul heavier loads and with less than half the effort, on as low as 10 lbs. air pressure. Musselman Doenut tires fold right over big bumps so there is no jolting the load. Will not damage lawn grass or pack soil in gardens or flower beds. This amazing little Doenut cord tire carries a load of 200 lbs. per wheel. Think of it! And rolls along twice as easy, too. Send 15c for blueprint drawing of any vehicle, or 50c for all four.

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I am enclosing ____ cents in postage for drawing of ____
Send wheel and parts catalog with drawings.

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CITY ____ STATE ____

BE A PASSENGER TRAFFIC INSPECTOR

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Fits in any pocket easily. Weighs only 4 ozs., as shown! NO tubes, batteries or electrical connections needed! Nothing to wear out or need replacement—only one moving part. Separates and receives ALL stations with beautiful clear tone by simply hooking to any metal object as desks, beds, telephones, etc. Range up to 300 miles—much greater under good conditions—very little static! Can be used by ANYONE ANYWHERE! Foolproof—NOT a cheap CRYSTAL outfit! Absolutely complete with midget phone and directions to use on Bicycles, Autos, in office, hotels, camps, at home, etc. No messy hookups! THESE ARE FACTS! Send only $1.00 and pay postman $1.99 plus postage or send $2.99 (Cash, Money Order or Check). Ideal gift. Guaranteed. Order NOW! (Foreign orders 50c extra). At Better Dealers.

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The only way your body can clean out Acids and poisonous wastes from your blood is thru 9 million tiny, delicate Kidney tubes or filters, but beware of cheap, drastic, irritating drugs. If functional Kidney or Bladder disorders make you suffer from Getting Up Nights, Nervousness, Leg Pains, Backache, Circles Under Eyes, Dizziness, Rheumatic Pains, Acidity, Burning, Smarting or Itching, don't take chances. Get the Doctor's guaranteed prescription called Cystex (Siss-Tex). Works fast, safe and sure. In 48 hours it must bring new vitality, and is guaranteed to do the work in one week or money back on return of empty package. Cystex costs only 3c a dose at druggists and the guarantee protects you.

3 Miles Down; Search of Black Gold

[*Continued from page* 66]

weight. So, by powerful scales attached to the drill cable, no more than 13,000 pounds of weight is ever permitted to rest on the bit.

Bits and drill pipe often scoop out the side walls, forming huge cavities, often start off in unexpected directions when they strike a slanting bed of material harder than that through which they have been boring. Then surveyors send down plumb bobs and cameras, plot the course of the hole as an engineer surveys for a map, and send down deflecting tools to send the bit back into the desired path.

New Bit Drills Through Steel

Recently there has appeared in the oil fields a bit of odd appearance which drills through iron and steel with the same ease it attacks shale and rock. This device, invented by C. F. Zublin of Los Angeles, consists of a gear ball set off-center on inclined shaft. Its motion is a combination of rolling around a cutter axis, rotation around a shank axis and vertical oscillation. The bit actually cuts a series of gears in the earth, then breaks them off piece by piece.

This bit has successfully drilled through a set of lost bits 11,000 feet down in the Belridge field, California.

Physical figures of deep drilling equipment are astounding. Walls of the small 4½-inch drill pipe are only a third of an inch thick, yet they possess a tensile strength of 95,000 pounds per square inch. In a two-mile-deep hole, provided 20-foot lengths of drill pipe are used, 510 couplings requiring 1,140 threaded joints must be made.

Temperatures Rise as Well Drops

In most present fields, the thermometer records an increased temperature of one degree, F., for each 50 feet of depth. At 10,000 feet, oil is hotter than boiling water. According to Prof. L. C. Uren, University of California petroleum engineer, oil at those depths probably exists as a vapor.

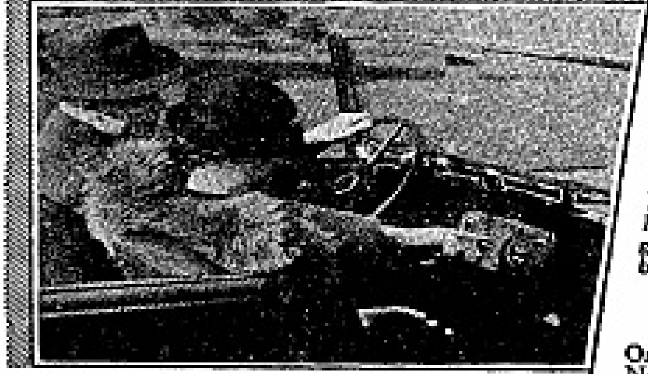
Recently a novel pump has appeared which consists of a plunger which falls the length of the hole, slides down through the column of oil standing at the bottom, closes automatically, then, by action of gas pressure from the rocks rises to the surface carrying its load of oil ahead. The plunger brings up approximately 60 gallons of oil on each trip.

Three miles probably marks the extreme depth to which oil wells will be drilled on account of high costs. On the average, wells of that depth will cost $400,000. With oil at its present price of $1 a barrel, a 10,000-foot well must produce from 600,000 to 750,000 barrels during the first three years of its flow, to return a profit to its owners.

New INVENTION SAVES GAS!

3 TO 7 MILES MORE PER GALLON

MOTORIST SAVES $180.00 a YEAR



Saves up to Thirty Per Cent On Gas. Provides Faster Pick-Up---More Power---Greater Mileage and Smoother Running.

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CHRYSLER
Have tried the Vacu-matic and it sure is fine. Better pick-up with a 30% gas saving.—John C. Martin, Pa.

V-8 FORD
I installed both Vacu-matics and they work excellent. On my own V8 Ford I notice wonderful performance in pickup, get-away and gas saving. — Burt Burnett, Mich.

BUICK
Everything you claim about Vacu-matic is true. I now get 20 miles to the gallon. Before I was only averaging 15½ miles. — C. Constantino, Fla.

PLYMOUTH
I am amazed at Vacu-matic performance. It's giving me 5 more miles per gallon. - Walter Zielinski, Ill.

FRANKLIN
With Vacu-matic I have increased my mileage from 10.1 to 14.2 miles per gallon. I figure I save over $75.00 a year in gasoline. R. K. Radtke, Wis.

SAVES $180 A YEAR
On my Plymouth 6 I obtained an average of 22 miles per gallon, an increase of 7 miles. This means a saving of $15 a month or $180 a year. F. S. Peck, Calif.

CHEVROLET
Please send me a Vacu-matic for a Model A. The mileage on my 1933 Chevrolet jumped from 18 to 22 miles per gal. with Vacu-matic. — Paul P. Haas, Mass.

ALL WELL PLEASED
Enclosed find order for 12 more. Everyone I have sold is giving from 4 to 6 more miles per gallon. I have 3 more orders for V8 Ford. Everybody is well pleased.—J. O. Carll, Texas.

MODEL A FORD
Have been using the Vacu-matic for a month. I used to get 20 to 22 miles per gal. Now I get 30 to 33 miles. It is amazing the difference it makes.—James W. Barr, Canada.

NASH
On my Advanced 6 Nash gained 17¾% in mileage. The car will idle down to 3 miles an hour and then take gas without a complaint. — J. Showalter, Mo.

DODGE
Just completed 2310 miles on 92 gallons in my 1933 Dodge 6. This figures 25 miles while before I averaged only 20 miles per gal. on trips. — Al Fruzyna, Calif.

OLDSMOBILE
I am well pleased with Vacu-matic on our Oldsmobile. A test proved it to give 18 miles per gal. Before we considered 13 good. — Arthur Williams, N. Y.

Above are just a few of the many unsolicited letters received from Vacu-matic users.

VACU-MATIC

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the Carburetor Control that "BREATHES"

AT LAST! Automotive engineers have smashed down the barriers to perfected combustion! The new VACU-MATIC solves the secret of greater power! With almost magical action, this amazing invention instantly puts new life and pep in any motor. It adds mileage to every gallon of gasoline . . . produces split-second pick-up, sensitive accelerator response, greater speed and smoother running

New- *Automatic* - Nothing Like It!

The self-starter—four wheel brakes—knee action—streamlining . . . and now VACU-MATIC! The greatest motor improvement of recent years! With it, engineers have achieved a practical means of balancing air and gasoline automatically for all speeds. Vacu-matic is *entirely different!* It is AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. Just put it on and forget it! Sharply cuts fuel wastes, saves dollars in gas costs, reduces carbon and gives your engine new pep, greater power and longer life.

Fits All Cars

VACU-MATIC is constructed of six parts, assembled and welded into one unit, correctly adjusted and *sealed at the factory*. Nothing to regulate. Any motorist can attach VACU-MATIC in ten minutes. Once in, its only reminder is the surge of instant power and speed it gives to the motor and the savings it affords your pocketbook.

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The VACU-MATIC Co., Wauwatosa, Wis.

Guaranteed Gas Savings

The VACU-MATIC proves itself on every car. It is guaranteed to give worth-while gas savings, quicker pick-up, and more power or it costs you nothing. "On a test I gained an average of 4 miles on a gallon," writes Alex Wertz. "Vacu-matic is the best I have ever tried." Clarence Rutzin—"I have tried the Vacu-matic on several tests and find that I get between 5 and 6 miles per gallon increase, have more mileage, have greater pickup."

Free Details

Learn about this remarkable device that so greatly affects the entire performance of your motor. Learn why your car is costing you extra money to operate without VACU-MATIC. See why your VACU-MATIC equipped car will leap away from traffic without sputter or hesitation. Discover a new driving thrill and enjoy the savings. Get the facts! Write today!

FREE OFFER COUPON

THE VACU-MATIC COMPANY
7617-125 W. State St., Wauwatosa, Wis.

Gentlemen: Please send me full particulars concerning the Vacu-matic and details of your Free Offer. This of course does not obligate me in any way.

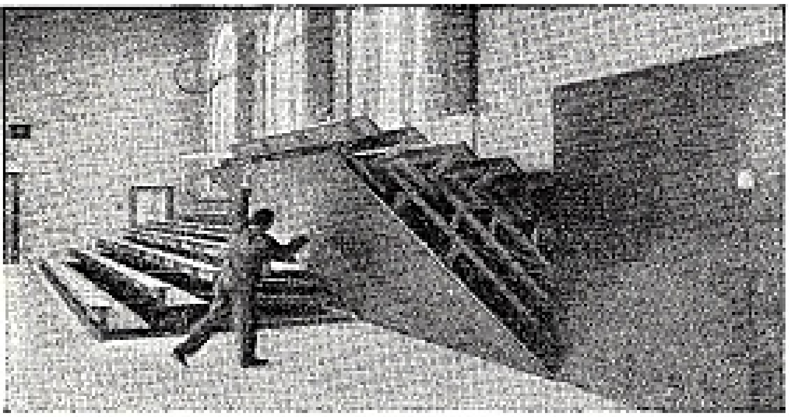
Name...

Address...

City.. State....................

☐ Check here if interested in selling proposition.

Business on a Changing Front



These folding grandstands can be raised or lowered by one man and have proven ideal for use in small gyms. When not in use, the wood bottom forms part of the wall, greatly enlarging the floor space. The seat supports are made of steel.

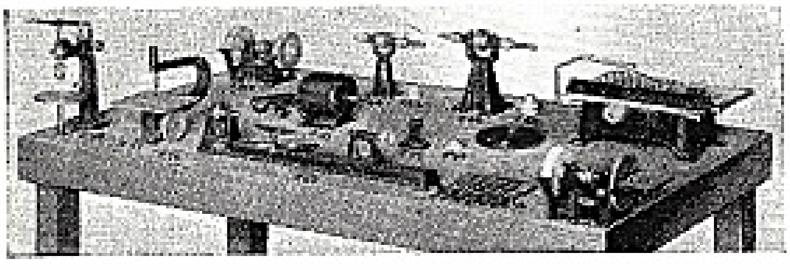
An all-purpose rubber coating may be applied to any surface to absorb shocks, prevent corrosion, silence noises, and act as water proofing. The rubber comes in plastic or liquid form.

A toggle designed to replace the operating wedge and rollers of Ford front brakes, allows the shoes to float on the backing plate rest, thus becoming of the self-centering type. Efficiency is greatly increased.

Electroplating with a brilliant polish is now possible through a new process developed in England. The plated object leaves the vat as a finished product, the process being entirely chemical.

An electric attachment unit employs corrugated spring inserts to insure a firm contact with the floor plug. Vacuum cleaner, radio and electric iron plugs cannot be accidentally dislodged.

A thief-proof vault, only 7½ inches high, is indestructible, and can be anchored immovably to wall or floor. A special key is necessary before the combination lock can be operated.



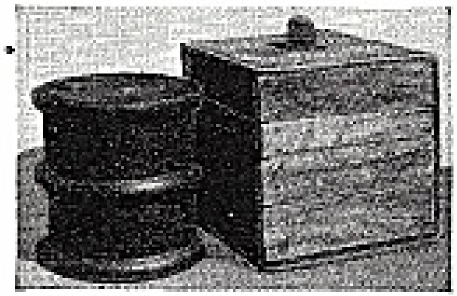
So compact is this set of woodworking power tools that it can be operated in a space no larger than a breakfast nook, and yet it is so complete it can handle all types of work. It is intended for use where workshop space is limited.

A tiny neon tube, connected in parallel with a fuse, lights when the fuse is blown.

Extra heavy duty batteries of 115 volts and 1,600 amperes are now produced for starting Diesels.

New perspective and isometric lined paper practically teaches drawing, and is a big aid in layout work.

Wallboard has been made moisture resistant, and will not buckle or shrink.



Weighing less than half a boxed glass carboy, these rubber drums are now being used to transport acids. The drums are unbreakable.

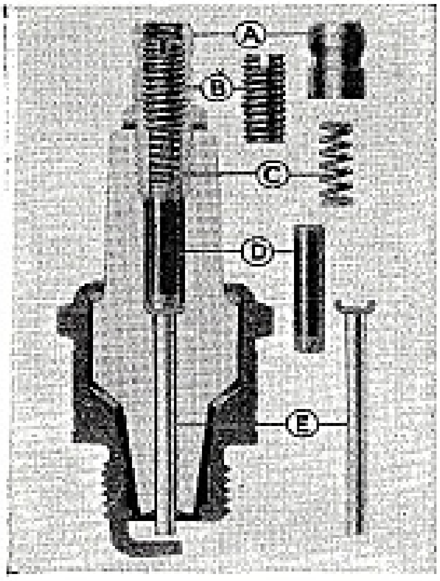
Blue flame oil burner units, built to fit in the fire box of any cook stove, range, or heating stove, burn 96 per cent air and 4 per cent cheap fuel oil and give three times the heat of coal.

Window frames built of solid aluminum or bronze include metal weatherstrips as an integral part of the frame.

An everlasting candle, made of hollow candle-shaped metal, burns benzine and fits any standard size candle stick.

Heavy enamel finish of a new type gives kitchen utensils the appearance of having been made of marble.

A nitrocellulose lacquer keeps cloth soft, flexible, and waterproof.



This new type spark plug, containing a resistor unit in the insulator, practically eliminates noise or click in automobile radio sets.

Editor's Note — Addresses of manufacturers of these and other new products in this issue can be obtained by sending a stamped, self-addressed envelope to Modern Mechanix and Inventions. *Manufacturers are invited to submit photos and literature covering new products for this page.*

Posed by professional model

GIRLS WOULDN'T LOOK AT ME WHEN I WAS SKINNY

but...

Since I Gained 10 Pounds This New, Easy Way I Have All the Dates I Want

NOW there's no need for thousands to be "skinny" and friendless, even if they never could gain an ounce before. Here's a new, easy treatment for them that puts on pounds of solid, naturally attractive flesh—*in just a few weeks!*

Doctors now know that the real reason why great numbers of people find it hard to gain weight, and suffer with indigestion, constipation and a blemished skin, is that they do not get enough Vitamin B and iron in their daily food. Now with this new discovery which combines these two vital elements in little concentrated tablets, hosts of men and women have put on pounds of firm flesh—*in a very short time.*

Not only are thousands quickly gaining normal good-looking pounds, but also naturally clear skin, freedom from indigestion and constipation, new pep.

7 times more powerful

This amazing new product, Ironized Yeast, is made from special *ale yeast* imported from Europe, which is the richest known source of Vitamin B. By a new process this yeast is concentrated 7 times—*made 7 times more powerful.* Then it is *ironized* with 3 kinds of iron which strengthen the blood, add wonderful energy.

If you, too, are one of the many who simply need Vitamin B and iron to build them up, get these new Ironized Yeast tablets from your druggist at once. Day after day, as you take them, watch skinny limbs and flat chest round out to normal attractiveness. Skin clears to natural beauty, new health comes, you're a new person.

Results guaranteed

No matter how skinny and rundown you may be from lack of enough Vitamin B and iron, this marvelous new Ironized Yeast should build you up in a few short weeks as it has thousands. If you are not delighted with the results of the very first package, your money will be instantly refunded.

Only don't be deceived by the many cheaply prepared "Yeast and Iron" tablets sold in imitation of Ironized Yeast. These cheap counterfeits usually contain only the lowest grade of ordinary yeast and iron, and cannot possibly give the same results as the scientific Ironized Yeast formula. Be sure you get genuine Ironized Yeast. Look for "IY" stamped on each tablet.

Special FREE offer!

To start you building up your health right away, we make this absolutely FREE offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body." Remember, results guaranteed with the very first package — *or money refunded.* At all druggists. Ironized Yeast Co., Inc., Dept. 5611, Atlanta, Ga.

FACTORY TO YOU

LATEST MODEL REMINGTON TYPEWRITERS

10¢ A DAY

MONEY BACK GUARANTEE

10-DAY FREE TRIAL OFFER

● Brand new, latest model Remington for only 10¢ a day! Here is your opportunity to get a perfect writing machine at an amazingly low price direct from the factory. Every essential feature of large office typewriters—standard 4-row keyboard, standard width carriage, margin release, back spacer, automatic ribbon reverse. Act now, while this special opportunity holds good. Send coupon TODAY for details.

YOU DON'T RISK A PENNY

We send you the Remington Portable, Model 5, direct from the factory with 10 days' free trial. If you are not satisfied, send it back. We pay shipping charges both ways.

FREE →

TYPING COURSE

With your new Remington we will send you — absolutely FREE — a 19-page course in typing. It teaches the Touch System, used by all expert typists. It is simply written and completely illustrated. Instructions are as simple as A, B, C. Even a child can easily understand this method. A little study and the average person, child or adult, becomes fascinated. Follow this course during the 10-Day Trial Period we give you with your typewriter and you will wonder why you ever took the trouble to write letters by hand.

FREE →

CARRYING CASE

Also under this new Purchase Plan we will send you FREE with every Remington Model 5 a special carrying case sturdily built of 3-ply wood. This handsome case is covered with heavy du Pont fabric. The top is removed by one motion, leaving the machine firmly attached to the base. This makes it easy to use your Remington anywhere—on knees, in chairs, on trains. Don't delay . . . send in the coupon for complete details!

CLIP COUPON NOW. . .

EVERY ESSENTIAL FEATURE found in standard machines

When you buy a typewriter, be sure you get one of the new, latest models, not a used or rebuilt machine. For you want a machine that has only the latest conveniences and devices. The Remington Model 5 you can get for 10¢ a day has every essential feature of big office machines. It is a complete writing machine—the most compact and durable portable ever built, one that will give you years and years of hard service. This beautiful machine offers unequalled economy in first cost, unequalled economy in service. Buy now. It is a real bargain.

SPECIFICATIONS. Standard 4-row keyboard. Complete visibility. Standard width carriage for long envelopes. Carriage return lever designed for easy and rapid operation. Margin release on keyboard. Automatic ribbon reverse. Back spacer. Two-color ribbon shift. Variable line spacer. Adjustable margin stops. Autoset paragraph key (one of the most useful features found on any typewriter.) Weight, 11 lbs. 12 oz. Furnished with Pica or Elite type.

MONEY-MAKING OPPORTUNITIES OPEN. Hundreds of jobs are waiting for people who can type. A typewriter helps you put your ideas on paper in logical, impressive form...helps you write clear, understandable sales reports, letters, articles, stories. A Remington Portable has started many a young man and woman on the road to success.

A GIFT FOR ALL THE FAMILY. If you want a gift for birthday, Christmas or Graduation . . . one Father, Mother, Sister or Brother will use and appreciate for years to come . . . give a Remington Portable. We will send a Remington Model 5 to anyone you name, and you can still pay for it at only 10¢ a day. Few gifts are so universally pleasing as a new Remington Portable. Write today.

SEND COUPON WHILE LOW PRICES HOLD

Remington Rand, Inc., Dept. 141-11
206 E. 42nd Street, New York, N. Y.

Please tell me how I can get a new Remington Portable typewriter, plus FREE Typing Course and carrying case, for only 10¢ a day. Also send me new illustrated catalogue.

Name______________________________

Address____________________________

City____________________ State____________

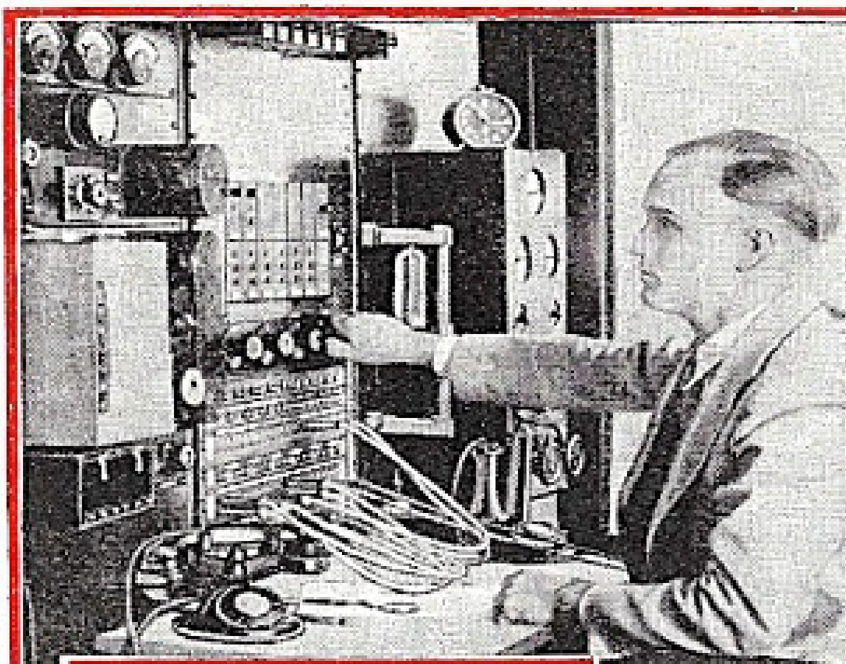
Double Pa

ge Spreads

BE A

MANY

I'll train you



If you are dissatisfied with your present job—if you are struggling along in a rut with little or no prospect of anything better than a skinny pay envelope—**Clip and Mail the Coupon NOW!** Get my big 64-page FREE BOOK on the opportunities in Radio. Read how quickly you can learn at home in your spare time to be a Radio Expert—what good jobs my graduates have been getting—real jobs with real futures.

J. E. SMITH
President National Radio Institute
The man who has directed the Home Study Training of more men for the Radio Industry than any other man in America.

Real Opportunities Ahead in Radio for Trained Men

It's hard to find a field with more opportunities awaiting the trained man. Why in 1934 the Radio Industry sold $235,000,000 worth of sets and parts! Over 300,000 people worked in the industry! It's a gigantic business, even in the poor business years. And look what's ahead! Millions of sets are going out of date annually. 20,000,000 sets are now in operation on which about $60,000,000 are spent EACH YEAR for repairs, servicing, new tubes, etc. Broadcasting Stations pay their employees (exclusive of artists) approximately $23,000,000 a year. Advertisers pay 600 great Broadcasting Stations over $75,000,000 a year for Radio time and talent. A few hundred jobs that paid $30, $50, $75 a week less than 20 years ago have grown to thousands. These figures are so big that they're hard to grasp. Yet they're all TRUE! Here's a new industry that has grown to be a commercial giant! No wonder business leaders predict a brilliant future for the great and growing Radio Industry.

Broadcasting Stations
Employ managers, engineers, operators, installation and maintenance men for jobs paying up to $5,000 a year.

Loud Speaker Apparatus
Installation and service work is another growing, money-making field for trained Radio men.

Set Servicing
Spare time set servicing pays many N. R. I. men $5, $10, $15 a week extra. Full time men make as much as $30, $50, $75 a week.

Sample Lesson FREE

Take advantage of this offer. Mail the coupon *Right Now*, and I'll send you *FREE* a Sample Lesson. This fascinating book, "A Bird's-Eye View of Radio," is just packed and jammed with information about this growing industry. The reason I am willing to send it to you is to PROVE that my Course is simple, easy to understand, and enjoyable to study. I want to SHOW YOU that I can train you, just as I have ALREADY trained hundreds of men. Many of them with not even a grammar school education, and no Radio or technical experience, have become Radio experts, and now make good money in Radio. Mail the coupon NOW.

A BIRD'S-EYE VIEW OF RADIO

Some Other Jobs N.R.I. Trains Men for

- Radio Service Business of my own
- Spare-time Radio Service work
- Retail Sales of Radio Sets and Equipment
- Service Expert for Retail Stores
- Broadcasting Station Operator
- Aircraft Radio Operator
- Ship Radio Operator
- Loud Speaker Systems, Installation and Service
- Auto Radio Installation and Service
- Television Station Operator
- Commercial Radio Station Operator

You Get PRACTICAL EXPERIENCE with RADIO EQUIPMENT I GIVE YOU

I'll show you how to use my special Radio Equipment for conducting experiments and building circuits used in such well-known sets as Westinghouse, General Electric, Philco, R. C. A.-Victor, Atwater Kent and others. You work out with your own hands many of the things you read in our lesson books. This 50-50 method of training makes learning at home easy, interesting, fascinating, intensely practical. You learn how sets work, why they work and how to make them work.

RADIO EXPERT

MAKE $30 $50 $75 A WEEK

at home • Mail coupon for FREE PROOF

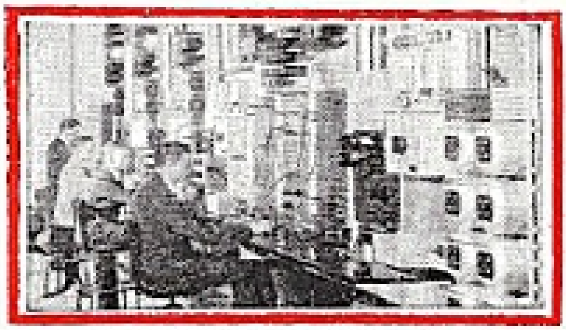
Get Into This Field With a Future

There's opportunity for you in Radio. Its future is certain. Television, short wave, police Radio, automobile Radio, loud speaker systems, aviation Radio, marine Radio—in every branch developments and improvements are taking place. Here is a real future for additional thousands of trained men who really know Radio. Get the Training that opens the road to good pay and success! Send me the Coupon NOW—and get full particulars on how easy and interesting I make learning at home. Read the letters from graduates who are today earning real money in this fascinating industry.

Learn At Home In Your Spare Time To Be a Radio Expert

Hold your job. There is no need for you to leave home. I will train you quickly and inexpensively in your spare time. You don't have to be a high school or college graduate. My Course is written in a clear, interesting style that most anyone can grasp. I give you practical experience under my 50-50 method of Training—one half from Lesson Books and one half from practical experience—with equipment I give you. This unique and practical method has been called one of the greatest developments in home study Radio training.

Many Make $5, $10, $15 a Week Extra in Spare Time While Learning



Every neighborhood can use a good part time serviceman. The day you enroll I start sending you Extra Money Job Sheets which quickly show you how to do Radio Repair Jobs common in most neighborhoods. Throughout your Training I send you information for servicing popular makes of sets! I give you plans and ideas that have made good spare time money—$200 to $1,000 a year—for hundreds of fellows. My Training is famous as "the Course that pays for itself."

Money Back If Not Satisfied

I am so sure that N. R. I. can train you at home satisfactorily that I will agree in writing to refund every penny of your tuition if you are not satisfied with my Lesson and Instruction Service upon completing your Course. You'll get a copy of this agreement with my Book.

64-Page Book of Information Free

Get your copy TODAY. It's free to any ambitious fellow over 15 years old. It tells you about Radio's spare time and full time job opportunities; it tells you about my Course; what others who have taken it are doing and earning. Find out what Radio OFFERS YOU—without the slightest obligation. MAIL THE COUPON in an envelope, or paste it on a penny postcard NOW.

J. E. SMITH, President
NATIONAL RADIO INSTITUTE
Dept. 5MH Washington, D. C.

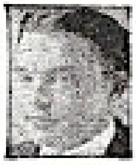
Gets Job While Training

"Before finishing your Course I was Radio Expert for the largest sporting goods store in North Carolina. Since enrolling I have made about $8,500. I want to thank N. R. I."—J. F. HUFF, 601 W. 19th St., Austin, Texas.

$40 to $100 Month Spare Time

"I am servicing broadcast, auto Radios and electrical appliances in spare time. I have run from $40 as high as $100 a month. My Radio work equals and often exceeds my regular salary."—JOHN J. REIDER, 530 Dayton Ave., St. Paul, Minnesota.

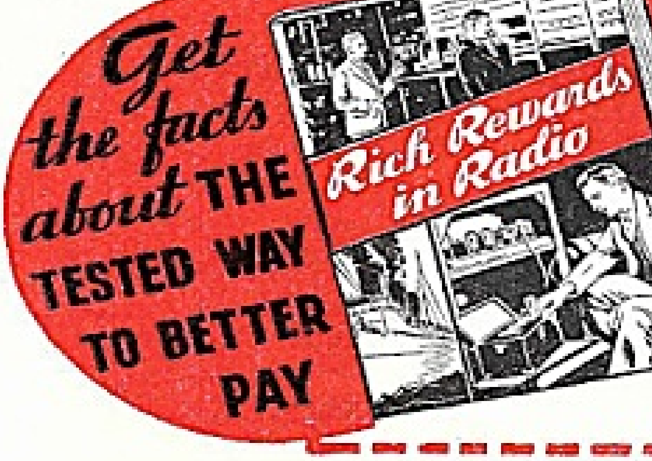
Own Business Pays $300 a Month



"I now have my own Radio business which shows three hundred dollars a month profit—thanks again to N. R. I."—FRANK REESE, 222 S. 60th St., Philadelphia, Penna.

Does Police Radio Work

"I am now doing the work on the Radio cars of the Police Department of West Seneca township. This is not a full-time job, but averages about $75.00 a week. Besides this I am working as assistant manager in a local Radio store and average $20.00 a week on this job. I say, 'Take the N.R.I. Course—It is the best'."—J. M. TICKNOR, 111 Edson St., Buffalo, N. Y.


Get the facts about THE TESTED WAY TO BETTER PAY
Rich Rewards in Radio

Mail Now for FREE 64 Page Book

J. E. SMITH, President
National Radio Institute, Dept. 5MH
Washington, D. C.

Dear Mr. Smith: Without obligation send me the Sample Lesson and your free book about spare time and full time Radio opportunities, and how I can train for them at home in spare time.

(Please print plainly) **R**

NAME...AGE...................

ADDRESS..

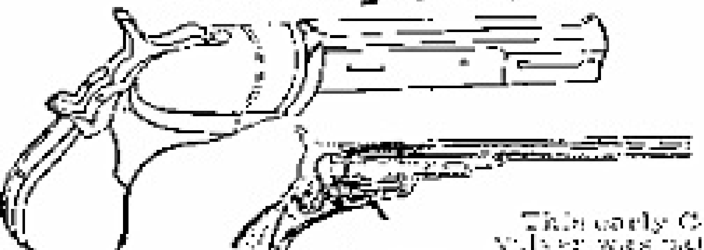
CITY...STATE...................

Get Valuable PATENT

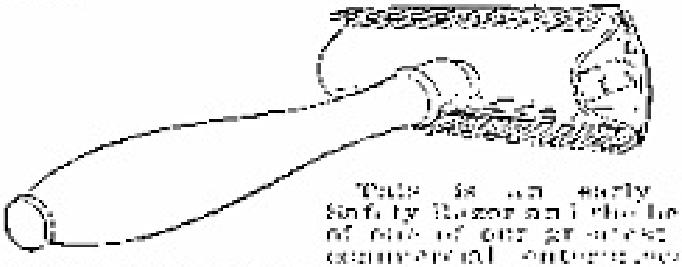
INVENTORS *Write for*

INTERESTING INVENTIONS

An Early Revolver



This early Colt revolver was patented in 1836. Samuel Colt, its originator, was known as the boy inventor. While still a lad he ran away to sea and whittled the first model of a repeating fire-arm out of wood during his leisure moments on shipboard. Colt is a good example of the inventor who was persevering. Three years later, in 1839, he had made improvements to produce the second revolver shown here. It was used in the Mexican War with excellent effect. By 1852, Colt had the largest firearms factory in the world. Colt died a very wealthy man.



This is an early Gillette Safety Razor and the beginning of one of our greatest modern commercial enterprises. Millions of safety razors have since been sold all over the world, and millions of dollars in profit have been made. For centuries men shaved with the old straight edge razor. Then came Gillette with his happy idea.

Many Little Ideas Have Big Commercial Possibilities

Look around in any direction today and see the inventor's handiwork. Many of the most successful inventions have been the small things found in ten-cent stores, drug stores, hardware stores and the like. Many inventions have come from men who did not consider themselves inventors at all. If you have an idea which in your judgment will make money, save money, save time, save labor or give pleasure—then see about protecting your rights to it. It costs you nothing to learn the facts. The Patent laws were made to protect the poor man and the rich man alike. But you must know how to take advantage of them.

"RECEIVED your book, 'Patent Protection'," writes an inventor, "and I am only sorry that I did not have the information contained therein some thirty years ago. I have been unfortunate enough through my ignorance to lose out in at least three major instances where understanding would have helped immeasurably."

Another inventor says: "In going through your book, one of your mechanical movements gave me an idea that I am sure I will be able to use in my invention."

We cite these statements from inventors simply to emphasize one point: Ignorance is dangerous where Patent matters are concerned. The easiest way for an inventor to lose his rights, his possible profits, is to do nothing simply because he doesn't know WHAT TO DO.

That is why inventors by the hundred have welcomed the book shown on the opposite page. It tells them WHAT TO DO. Its facts are valuable, often vital. They may be the means of saving money, saving time, and most important, saving later disappointment.

Can You Answer These Questions?

How do the Patent Laws protect an inventor? What is the first simple step to take to establish a claim to an invention? What kind of a sketch or drawing is needed? When is a model needed? What can an inventor do to secure financial assistance? Why a Patent is necessary? What can be Patented? What a competent Patent Attorney can do for you? What will it cost? What is the preliminary search and why it is important?

These and other questions are answered in our 48-page book of facts, "Patent Protection." In it, we have tried to put the practical, usable information which from thirty-six years' experience we know the average man requires. Among other things it shows interesting inventions, 115 mechanical movements, views of the U. S. Patent Office, and much more. It is yours for the asking. We gladly send it with our compliments to serious, interested men.

HOW WE HELP INVENTORS

For thirty-six years—more than a third of a century—it has been our business to help inventors to assist them in securing ALL THE PROTECTION TO WHICH THEY ARE ENTITLED. We have represented not a few inventors, or a few hundred, but THOUSANDS of them in their dealings with the U. S. Patent Office.

We answer questions—thousands of them a year. We study each device to bring out its best Patentable possibilities. We often dissuade inventors who might have gone ahead with inventions which could not possibly have been protected. By methods of efficiency, carefully developed over a long period, we endeavor to keep expense at a minimum. We arrange deferred payments where they are needed.

FACTS · FREE

RUSH these BOOKS

THIS COUPON TO VICTOR J. EVANS & Co.

REGISTERED PATENT ATTORNEYS

MAIN OFFICE: 520-M. VICTOR BUILDING, WASHINGTON, D. C.

Other Offices: 1540-B Conway Bldg., Chicago; 1007-B Woolworth Bldg., New York; 514-B Empire Bldg., Pittsburgh; 1010-B Hobart Bldg., San Francisco; 736-B Security Bldg., Los Angeles.

Kindly send me a FREE copy of your book "Patent Protection" and also your special booklet of Suggestions on When and How to Sell an Invention. (Note: You can also secure the books by writing any of the branch offices listed above.)

Name ....

Street and No. ....

City or Town ....State..................

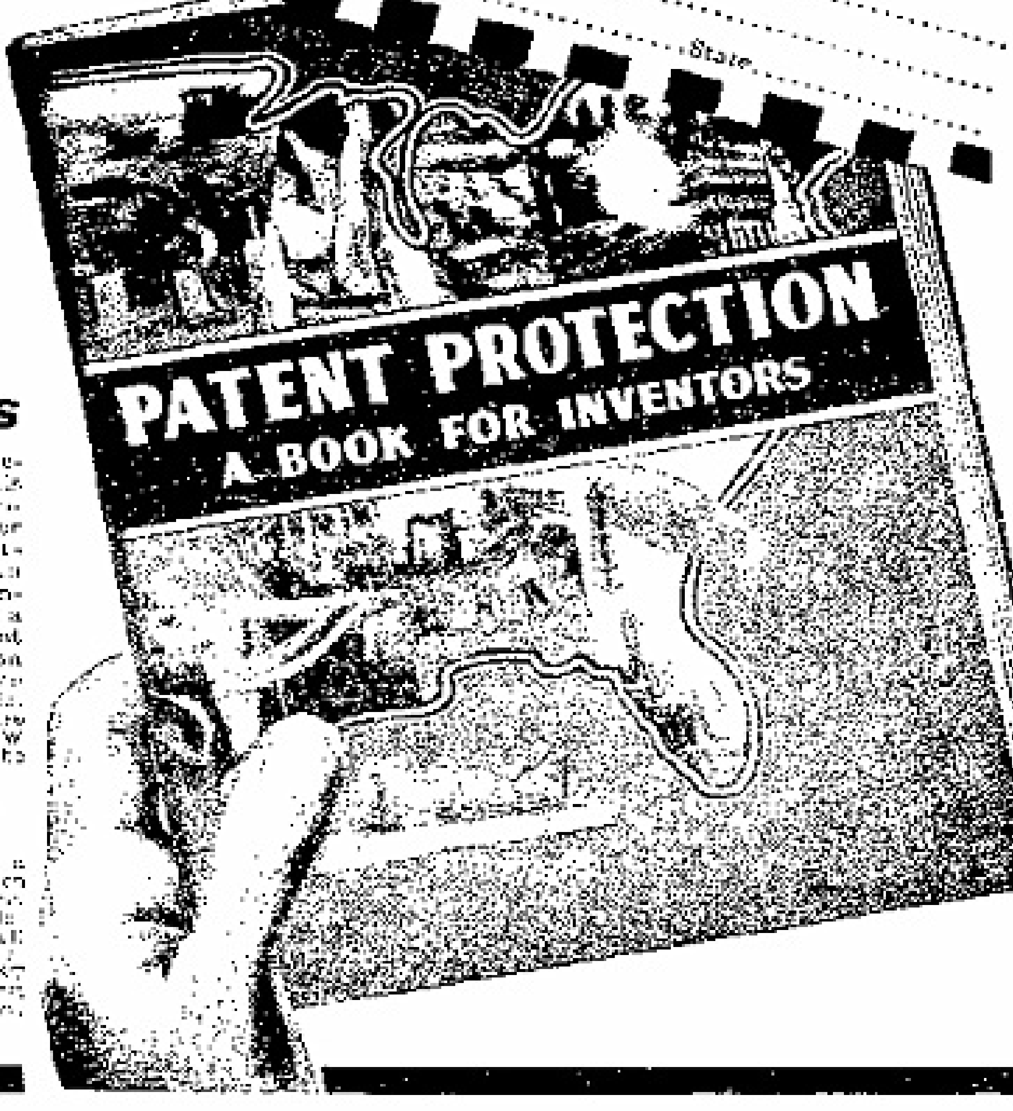
Suggestions on
WHEN
and
HOW
to Sell an
INVENTION

This is a ·NEW· Book About Selling Inventions

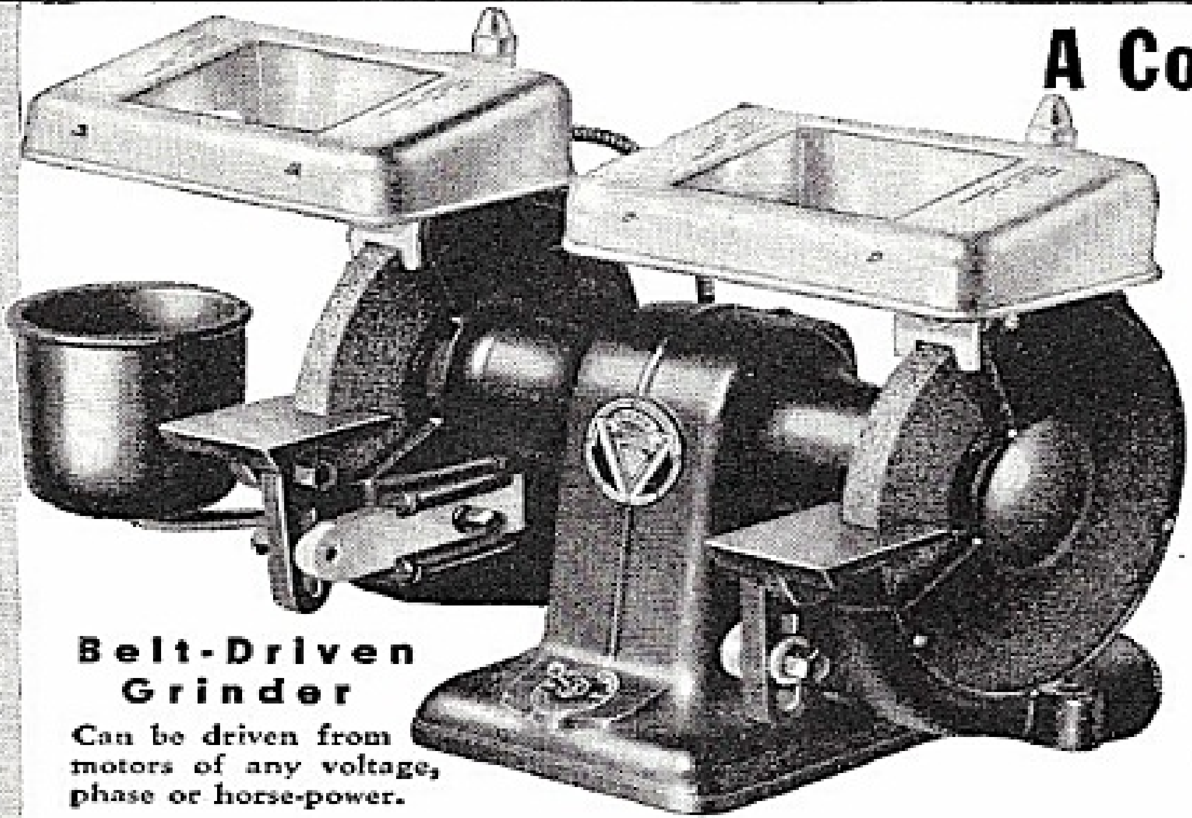
There are two sides to every inventive success: There is the inventive side which deals with the invention itself. There is the commercial side, which is the way the inventor sets about getting his invention on the market. A good invention, poorly handled, can prove a failure commercially. An ordinary invention, properly handled, can be made a money maker. In a NEW special booklet just published, we give you some suggestions on "When and How to Sell an Invention". We give you [illegible] advice on the commercial side of invention. Write us a card, letter, or use the handy coupon. Look before you leap. KNOW THE FACTS. They cost you nothing. They can be worth much.

STRICTEST SECRECY

With these two booklets we will also send you a FREE copy of our "Evidence of Invention" form on which you can sketch and describe your invention and establish a date of disclosure. Such a dated sketch and description may later prove important to you. We send full instructions for its use. All letters, sketches, data or models you send us are held in STRICTEST SECRECY. You can write us frankly. But your first step is to get the facts. Sign and send the coupon now. Get that much done today.



New 1936 TOOLS



Belt-Driven Grinder

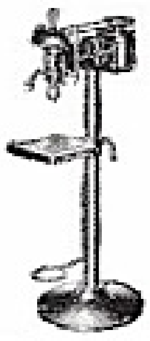
Can be driven from motors of any voltage, phase or horse-power.

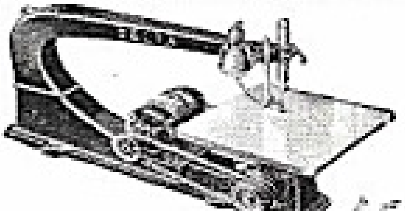
A Complete Line of NEW GRINDERS

Not just another line of grinders—but revolutionary *new* grinders in every sense of the word! Belt-driven, motor-driven and pedestal models—they all embody Delta's high standards of design and construction. No pains have been spared to make these new Delta Tools *ideal* in every way—convenient, safe, accurate and efficient—truly, here are the grinders that shopworkers have always wanted—and at the unusually moderate Delta price levels.

Setting New Standards of Grinder Efficiency

These "Triple-Duty" machines embody numerous features that make them the most efficient grinders ever developed. These features include: **1.** Balanced Wheels to insure true running and absence of vibration; **2.** Maximum room on all models to permit operator to swing work around wheels; **3.** New Departure self-sealed ball-bearings; **No oiling needed for life of bearings; 4.** Very efficient wheel guards, complying with all safety codes; **5.** Convenient built-in switches on all models; **6.** Fully adjustable and instantly removable tool rest; **7.** Water pots on all models, combination tool tray and water-pot holder on all pedestal models; **8.** New Combination Lamp attachment and Spark Guard assuring maximum illumination and complete safety from sparks; **9.** A complete range of models in bench, pedestal and belt-driven types. For further details and complete information about Delta Grinders and all other Delta "Quality" Tools write for catalog!





Delta QUALITY represents real ECONOMY

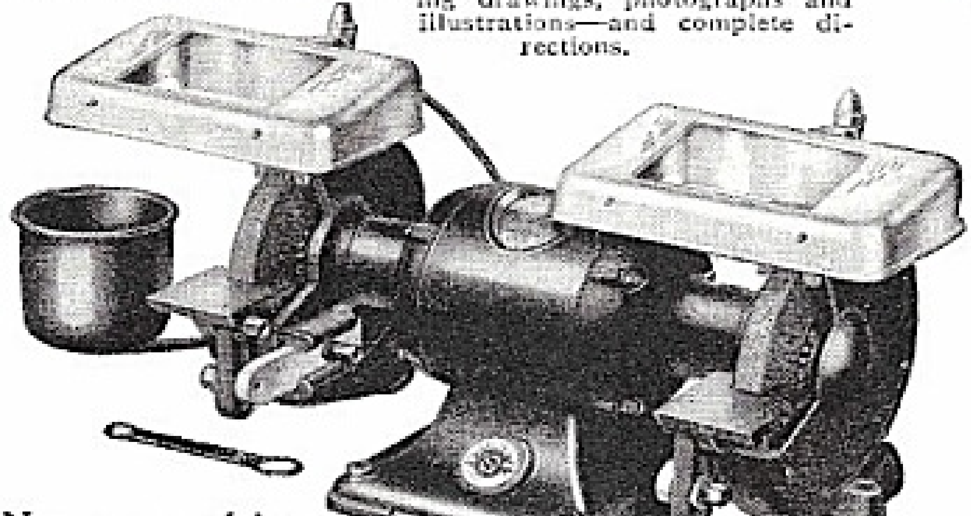
By "DELTA"...

If you are at all interested in motor-driven tools for use in home workshops, factories, farms, construction work, or small shops, be sure to see the new 1936 Delta line. The efficient performance, rugged precision construction, and fine workmanship of these compact economical tools are a revelation. You will understand then why Delta tools are used and recommended by tens of thousands workshop owners all over the world.

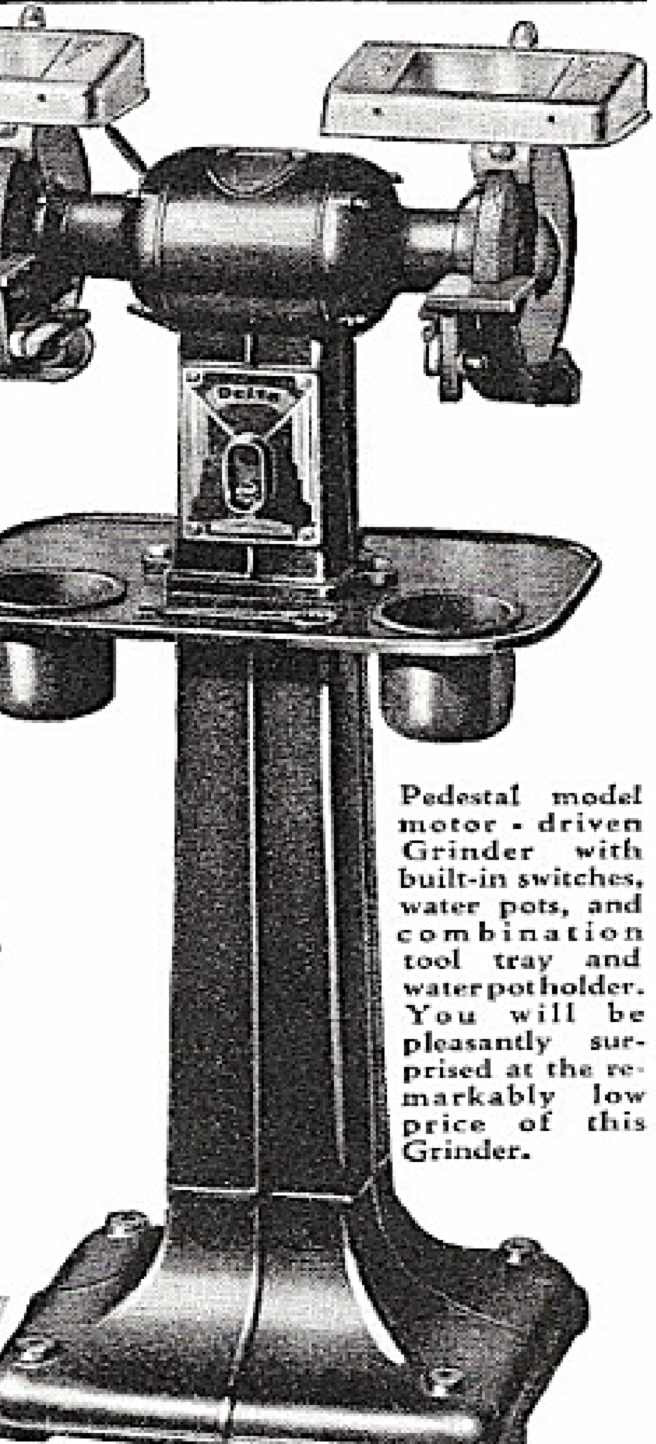
Write for Latest CATALOG

It is crowded with photographs and information about the new line of 1936 Delta tools. It contains much valuable information that every man interested in wood-working tools should have. It shows how Delta tools are built to stand the grind of production work, and yet are so low priced as to be within the reach of all, how they save time, money and labor—and quickly pay for themselves.

Mail coupon without delay. Enclose only 10 cents at same time for Book of Practical Delta Projects, 32 pages of new and novel things to make, with numerous blue prints, working drawings, photographs and illustrations—and complete directions.



New motor-driven Bench Model Delta Grinder.



Pedestal model motor-driven Grinder with built-in switches, water pots, and combination tool tray and waterpotholder. You will be pleasantly surprised at the remarkably low price of this Grinder.

New 1936 Project Book

32 page book "Practical Delta Projects"—crowded with new and "out of the ordinary" things to make—with numerous working drawings, photographs and easy-to-understand illustrations. Simple, complete instructions make every project easy to follow. Every woodworker should have this book. Send only 10 cents with coupon. Book and 1936 Delta catalog will be mailed postpaid.

DELTA MFG. CO.
600-634 E. VIENNA AVE.
MILWAUKEE WIS.

DELTA MANUFACTURING COMPANY,
600-634 E. Vienna Ave., Dept. M 1135
MILWAUKEE, WISCONSIN

I enclose 10c (stamps or coin), for which please send me one copy of "Practical Delta Projects". Also place me on your mailing list to receive 1936 Delta catalog of quality motor-driven woodworking tools.

Name..

Address...Age....................

City..

....State......................

☐ Check here if you are a Delta user now.

Random Chips from

WE VENTURE to guess that you will remember this issue for years. It may be the means of bringing you a cash prize of $750.00 in MM's $1,750.00 contest. Here is a contest in which everybody has a chance to win a prize. Better start work on it now. Then there's "Tiny Tom," the finest model locomotive in 00 gauge we've seen in a long time. By getting the blueprints now you can have the entire railroad built before Christmas.

Who will be the lucky winner of $750 in cash, first prize in MM's big $1,750.00 contest? Start unscrambling photos now.

With football in the air everywhere we offer you a choice selection in Bernie Bierman's own words. And Jimmie Doolittle answers timely questions on aviation. But we'd better not go on. After all half the fun of reading MM is browsing through it to see what it has to offer.

****

The Workbench's own contest seems rather small compared to that $1,750.00 in cold cash being offered on page 42. But don't stop sending in your photos. There is no reason why you can not win prizes in both contests.

Here is Walter Craig flying high above Alabama in his glider. His hand pulled a string that tripped the shutter. His photo was awarded the first prize of $5.00 this month.

This month's first prize goes to the unusual self-portrait of Walter Craig taken while flying in his glider hundreds of feet in the air. He says:

Selma, Ala.

Dear Editor:

Enclosed please find picture of me and my hobby—gliding. The picture was taken as I soared many hundred feet in the air. The camera was tied to a wing of the glider and snapped by means of a string attached to it.

Walter Craig.

****

That won $5.00 and second prize of $3.00 went to another MM midget car:

Omaha, Neb.

Dear Editor:

I am sending photos of a midget car built by my Dad and me from your magazine. It has a ¾ h.p. motor and can do about 20 m.p.h.

The motor starts with a rope like an outboard motor. It is very easy on gas since I get about 60 to 70 miles on a gallon. The "free action" wheels help a great deal when the wheels hit stones or when the car goes over the curb.

Grant Keller.

Blueprints for this midget automobile with free action wheels can be obtained from MM for 25 cents.

****

Third prize of $2.00 was awarded to Myrl Lemley for his photo and this letter:

Route 1, Brighton, Iowa.

Dear Editor:

The photo shows the one-tube transmitter described in your July issue. I used plug-in coils, however, to make it easier to shift wave bands. In the same case I have a one-tube receiver, making a transceiver outfit which is portable. The microphone in the photo is also homemade.

the Editor's Workbench

The junior operator in the photo, Mary Jane Lemley, we think is the youngest radio "bug." She is 22 months old, talks over this transmitter and operates the receiver also. We have two of these outfits and use them to carry on conversations from two points without aerials.

Myrl O. Lemley.

Lemley would like to hear from readers who have built 6-volt wind power battery charges. He also built MM's arc welder, mounted it on a trailer with a Ford T motor, and declares it is a fine outfit.

****

Before leaving the subject of our monthly contests, we want to announce a slight change in the rules. We will continue to award the three prizes each month to the best photos of and letters about things built by our readers. However, to qualify, each entry in these contests must state in his letter the article or department he likes best and the article or department he likes least in the current issue of MM. You don't have to say why you like or dislike an article or department; simply name the one you like and the one that did not "click" with you. We hope to announce the first winners under these rules in the January issue. Send your photos in now!

****

If any of you are building the gas-powered model plane in the August and September issue, don't let the drawing of the lower wing panel confuse you. The scale is correct but the overall length of the wing is 25$\frac{1}{16}$ inches or 31$\frac{3}{16}$ inches if two sections are added.

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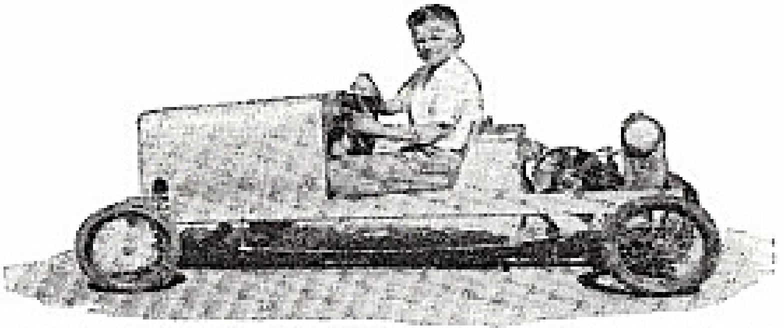


MM's "free action" midget car in action. Built by Grant Keller and his father, it took the second prize of $3.00.

Lionel George has this to say about the "power takeoff," described in the November, 1934, issue:

Dunstable, Alta.

Dear Editor:

The "power takeoff" the plans for which appeared in your magazine is standing up and performs perfectly. We use it in crushing grain and sawing cordwood.

Lionel George.

[*Continued on page 26*]

MM's Author of the Month

The author who contributes to each issue of MM an article for amateur microscopists is Dr. Julian Dana Corrington of Rochester, New York. In his spare time he also submits articles on this subject regularly to several scientific magazines and has written a book for the Bausch and Lomb Optical Company, "Adventures With the Microscope."

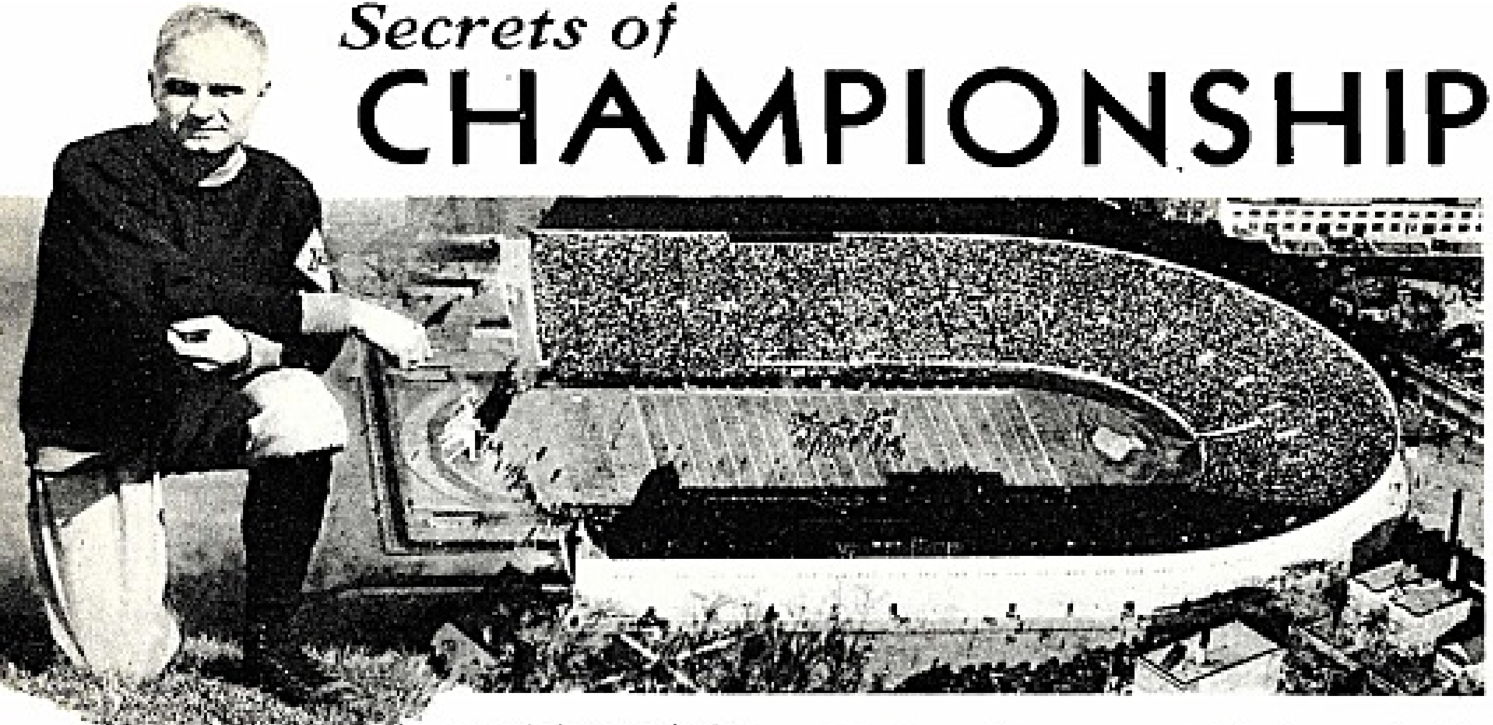
His regular duties for Ward's Natural Science Establishment, Inc., include head of the microscope slide department, editor of publications, and in charge of educational service. A number of scientific papers on anatomy and field zoology comprise his other writings.

Dr. Julian D. Corrington.

Before coming to Ward's in 1931, Dr. Corrington was for ten years professor of biology or zoology at the University of South Carolina, Syracuse University, and Drew University. He graduated from Blees Military Academy, Macon, Missouri, in 1909, and from Cornell University in 1913, subsequently touring Europe on foot, serving during 1918 as a Second Lieutenant in the Air Service, U. S. A., and obtaining his Ph. D. in zoology from Cornell in 1925. He is a Fellow of the American Association for the Advancement of Science and a member of Sigma Xi and Phi Beta Kappa.

Dr. Corrington is 43 years old, is married and has a daughter of 18 and a boy of 9. He was born in Hot Springs, Ark., December 22, 1891. His wife, formerly Veronica Flicke of Brooklyn, N. Y., is an artist. She executes all of the drawings for his articles and books, as well as contributing her work to other publications.

Secrets of
CHAMPIONSHIP



Behind the great football team which jammed the University of Minnesota Memorial Stadium, above, with howling spectators was the man at left, Head Coach Bernie Bierman.

I'LL take a quarterback, please—at least, I am willing to start with one. Call it what you will—a prayer, a theme song, a plank in a coach's platform—but there you have the hope eternal that springs in my heart.

Let them talk of systems—Notre Dame, Warner, Howard, Jones, Michigan—but you'll notice that when these or any other system is clicking there generally is a capable man directing field strategy.

Mind, I said "capable." Great elevens have existed without great quarterbacks, but rarely without capable ones. On the other hand, great quarterbacks at times have lifted merely capable teams to dizzy heights.

Go through your record books and pick them out—Eckersall of Chicago, McGovern of Minnesota, Barret of Cornell, Dorais and Carideo of Notre Dame, Dawson of Tulane, and Warburton of U. S. C., to mention only a few—they all had it, that immortal fire that woos other men to rise beyond themselves in the heat of battle.

Step from the sidelines or the stands and run invisible at the elbow of such a lad, taking part in both his mental and physical processes, as he goes through a game.

Delving into his mind, we should learn that he knows instinctively what plays to call for at any point in the field as well as what plays to keep under cover. To him, "do not" in many cases looms up as more important than "do."

The forward pass, for instance. There's

GOAL
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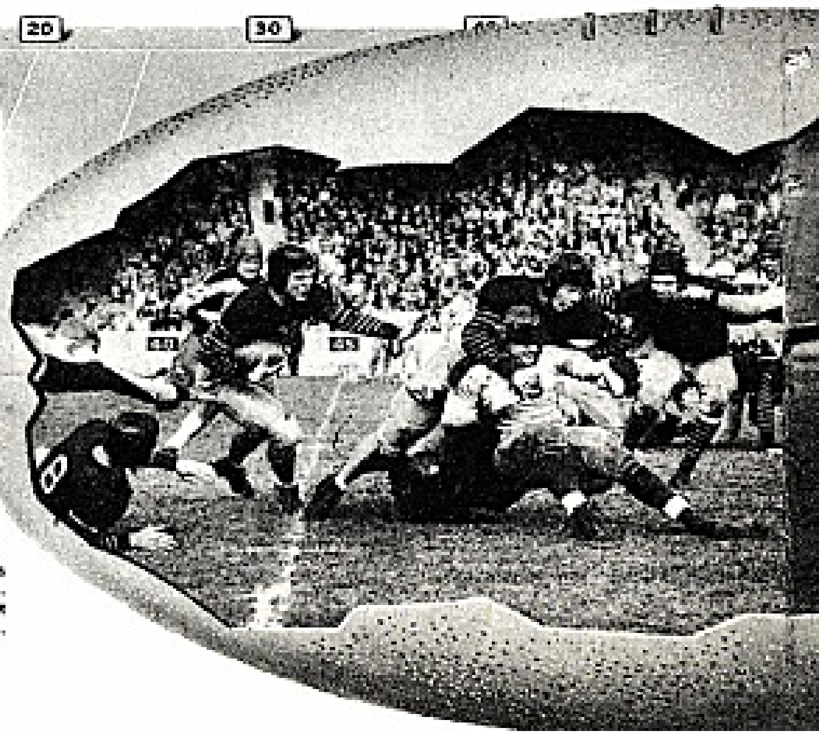
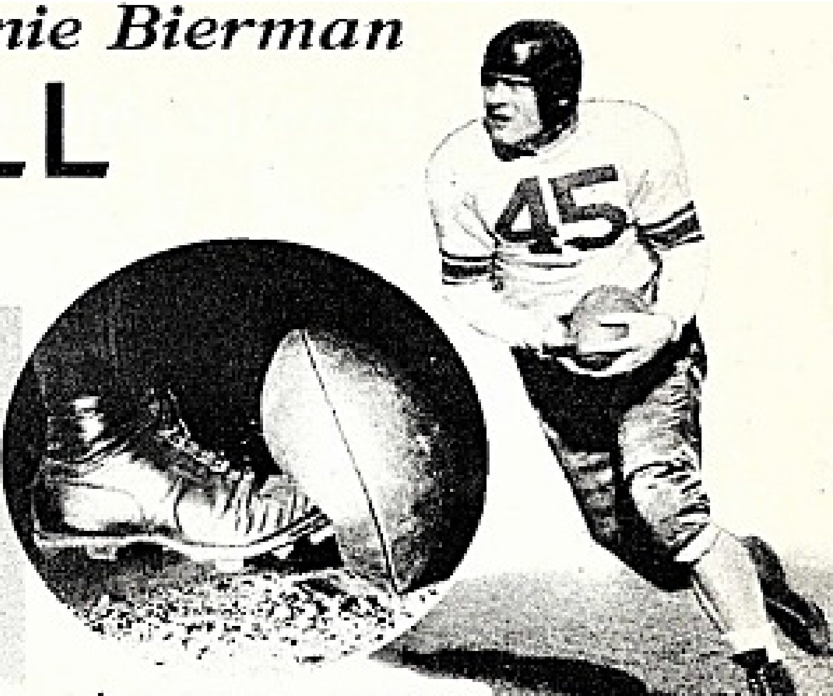


In the danger zone, 30 yards from his own goal, Moynihan of Boston College punts on second down in the battle against Fordham. Right—In safer territory, Fred Blower, U. of C. opens up against the Olympic Club with a tricky end sweep from his 40 yard line.

By Bernie Bierman

FOOTBALL

Bernie Bierman, coach of the University of Minnesota's championship Gophers, takes you from the grandstand onto the gridiron in this thrilling article on championship football. You stand beside Bierman's quarterback, dissecting your foe's plays and planning new drives.



The football receives the kick-off, and "Pug" Lund, Coach Bierman's outstanding All-American star, receives the football. Pandemonium breaks loose, and the game is on.

a ticklish play, and you'll find he will never pass in his own territory early in the game with the score even. Neither will he risk losing the ball on a pass near his opponent's goal line while his running game is working, nor will he pass near the sidelines unless he has a specially worked out trick play up his sleeve.

He would never violate the cardinal rule of generalship that bans the pass when he is ahead late in the game. He knows that many a tight contest has turned from victory to defeat on the needless chance taken in such a situation.

And punting! His instinctive knowledge there is certain also. It's usually good policy to punt on first or second down within his own 15 yard line and on second or third down within his 30 yard line and usually on third down within the 40 yard line, you will learn as you watch him.

He knows it's safe to kick on fourth down only beyond the 40 yard line. The probability of a blocked kick increases with each succeeding down, he reasons, and it is anything but pleasant to have a blocked kick in dangerous territory.

But let us trail him around in invisible guise. Are you ready for the kickoff?

There goes the ball, curving gracefully into the arms of the opponent fullback as he stands a yard behind his goal line. These opponents are not going to be a cinch. They too have the champion spirit as well as sound football technique and the game is apt to

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GOAL
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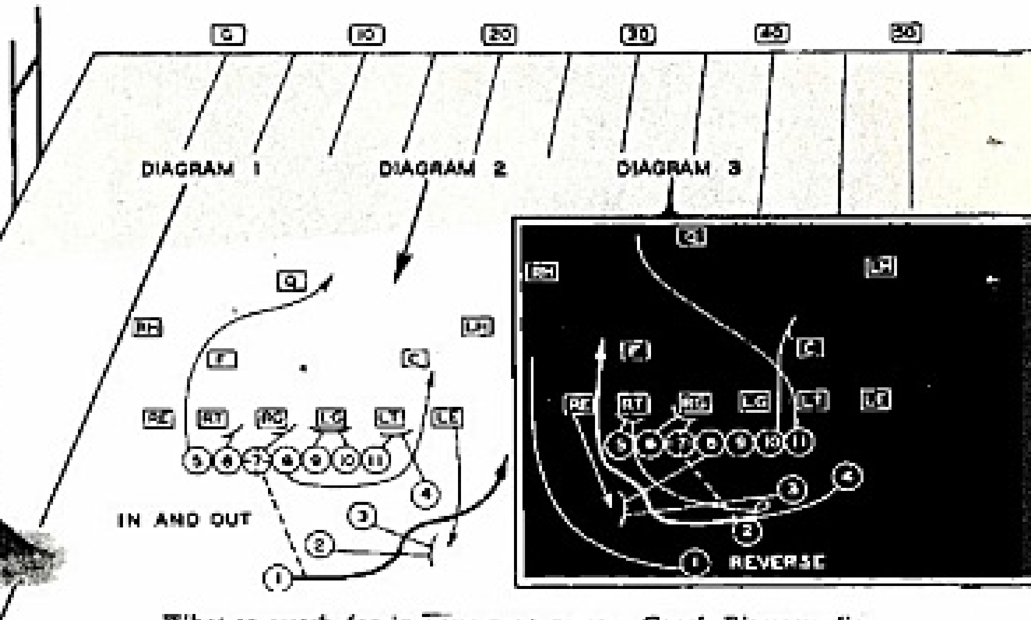
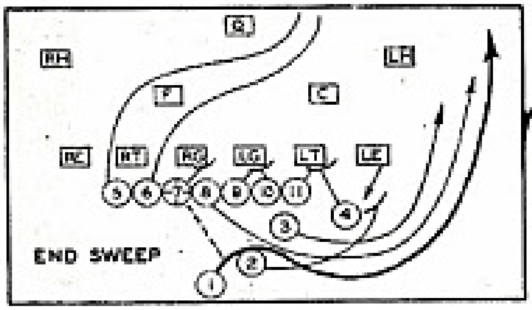
67

Left—Past the 50-yard line and into enemy territory, the quarter calls for a pass, and Cal Clemens, U. of S. C. takes it to defeat Oregon U. Above—Goal in sight. Signals! A line smash, and Murray of Penn scores against Cornell.

Great Quarterbacks Make Good Teams Great





What to watch for in your next game. Coach Bierman diagrammed six of his favorite plays, each one designed to be used in a certain part of the playing field. Note how plays become increasingly spectacular as the ball is marched down the field, and the strength behind the power drive near goal.

How an All-American quarterback looks to his opponent center. Cotton Warburton, U. of S. C., caught as he received a pass from center.

turn on the skill of the respective field generals to take advantage of the breaks.

Our quarterback, in conference with his coach, has scouted that fact, however, and has arrived at certain definite conclusions which form his plan of battle.

His line is powerful, fast and strong—big and speedy enough, in fact, to spare a man from the center to play back on defense and aid the secondary. This arrangement should meet the opponent's running game with more than fair success.

But there is a smart forward pass attack to cope with, too, and so the coach and the quarterback have decided to make a waiting game of it—let the other fellow do the work while we hold on and see what he has. No use getting all fagged out and excited. The opponents are known for their liking to score early if they can. They may press too hard and make a mistake or two.

The opponent fullback carries the ball back 22 yards before being downed. He carries it again on the first down and gains a yard. An end sweep comes next, but our big end knows that one and dumps it for a two yard loss.

The punt that follows, sails down the field 45 yards and strikes the ground near the sidelines. Our quarterback gathers it in on the bounce but we can see he hasn't his hands on

Football—Sport of Ages

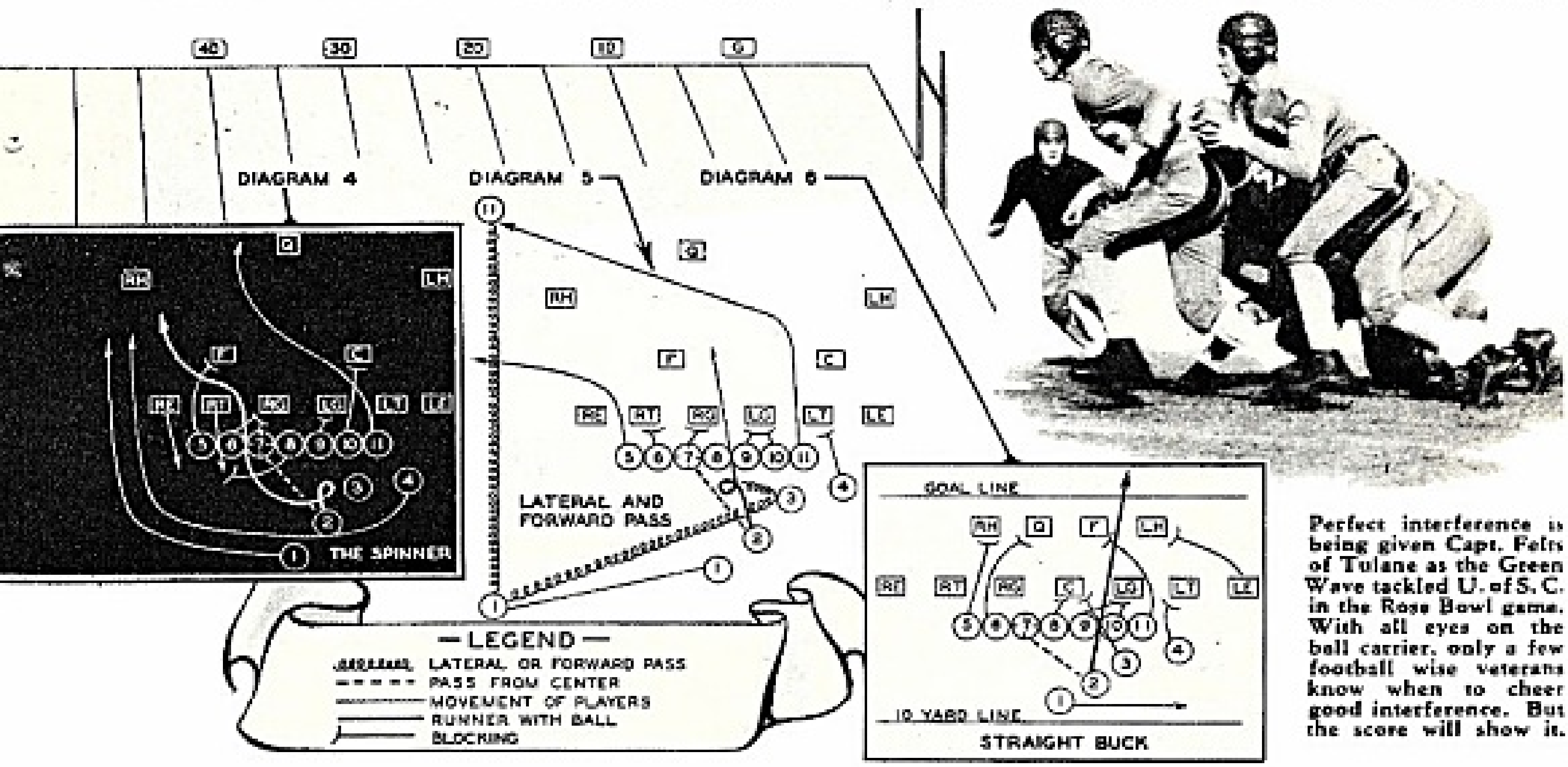
"This stone commemorates the exploits of William Webb Ellis, who, with a fine disregard for football rules, first took the ball in his hands and ran with it, thus originating the distinctive features of the Rugby game. A. D. 1823." So reads the inscription on an ancient stone in the wall around the Rugby School for boys in England. But football goes back farther than that.

The Greeks had a word for it, and later, Roman legions carried a more vigorous form of the game throughout Europe. By 1200 A. D. the game consisted of sides of unlimited numbers, each intent on kicking a round stone or inflated bladder across the opponent's line. Legs, arms, and even skulls were broken in the fracas. By Shakespeare's time, every school in England had a football team.

Phillip Stubbes, writing in 1583, says, "As concerning foote-balle, I protest unto you it may rather be called a bloody or murthering practice than a fellowy sport or pastime. For dooth not everyone lie in wait for his adversary, seeking to overthrow him and pickle him on the nose . . ."

Way before 1800 the Indians were showing American youths a crude kicking form of football with few rules but plenty of broken shins. It was not until 1845, however, that Harvard had its first crack teams, with other colleges starting shortly after. The first intercollegiate game was held at New Brunswick, N. J., in 1869, when Rutgers college put 26 men on the field to swamp Princeton's 21 man team. Later rules reduced the teams to 11 men each.

First Half—BRAINS; Second Half—POWER!



Perfect interference is being given Capt. Felts of Tulane as the Green Wave tackled U. of S. C. in the Rose Bowl game. With all eyes on the ball carrier, only a few football wise veterans know when to cheer good interference. But the score will show it.

it before a big tackle streaks through the air and crashes him to the ground.

Fumble—and when the pileup untangles, an opponent guard is flattened safely over the ball. Too bad, but our quarterback isn't flustered. He has gone into the game calmly and this is just a bad break that must be met and overcome.

The opponents line up quickly now. The ball is snapped, a scurry of jersey clad forms ensues, and suddenly, a big back is emerging to the right on a reverse play. Other forms dart forth to block for him and a three yard gain results. A forward pass comes now, but our center smothers that and then a long pass is tried that the right half bats down.

The punt that follows rolls over our goal line and is brought out 20 yards.

All right, Mr. Quarterback, you have the ball now, let's see what you've got.

Our quarterback tries an end sweep (diagram 1), one of his brilliant halfbacks taking the number 1 position while he becomes number 3 to help block up the field. It isn't our quarterback's policy to tire himself unduly or take chances of getting banged up carrying the ball too often. The sweep gains only a yard and then comes a punt.

So it went during the first period and most of the second, our men keeping their heads and playing strong defensive football to hold the opponents when they had the ball. When he did get the ball, our quarterback used only safe plays—the plunge and the sweep described above, varied with an in and out play (diagram 2) and a reverse (diagram 3).

Only one first down resulted from such tactics for our side, on other occasions our right half punting the ball down the field.

With five minutes of the second quarter remaining, however, the opponent fullback found a hole through our left side and came through on a spinner for eight yards. Two more yards for a first down resulted from a slide off tackle.

A forward pass tried on the next play was grounded by our fullback and then the big opponent fullback found the hole in our left side again with his spinner. He came 11 yards and our entire secondary, including our quarterback, moved in to stop him.

Suddenly, he turned and flipped the ball to the left. A halfback had sneaked through another hole behind him and now took the ball on the dead run for a clear romp 45 yards over the goal line. The goal kick was good as a matter of course—the opponents having a guard who never missed.

We kick again to the opponents, now chaffing and eager for more scoring. But the calmness of our quarterback is reflected in the other team members and they settle down to hold again as if no score had been made.

Twice more before the period ends, our

[*Continued on page 132*]

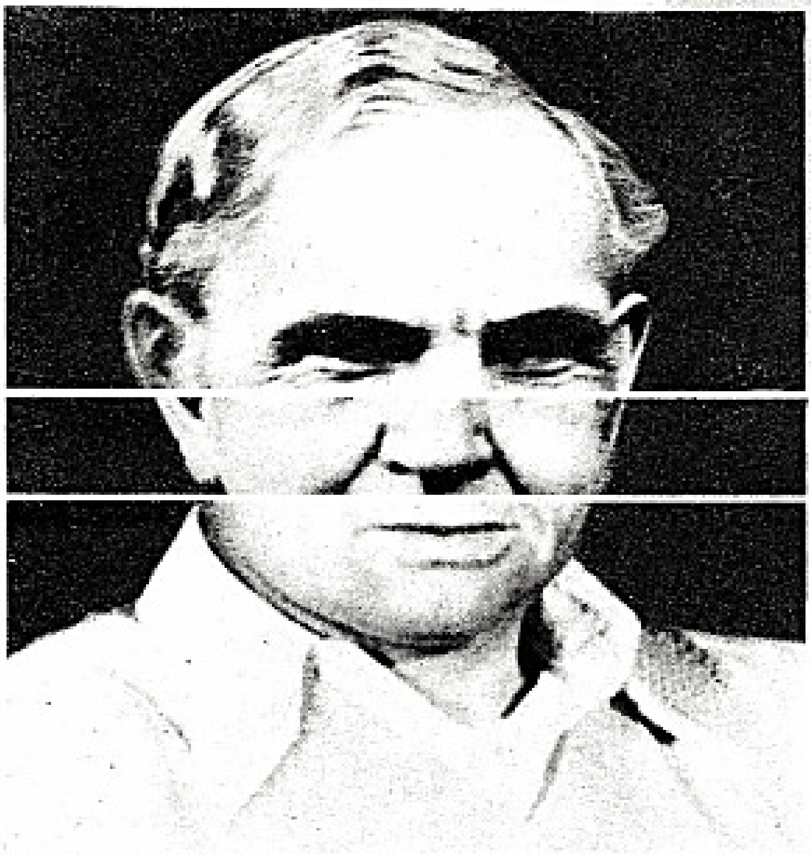
Unscramble Photos to Win

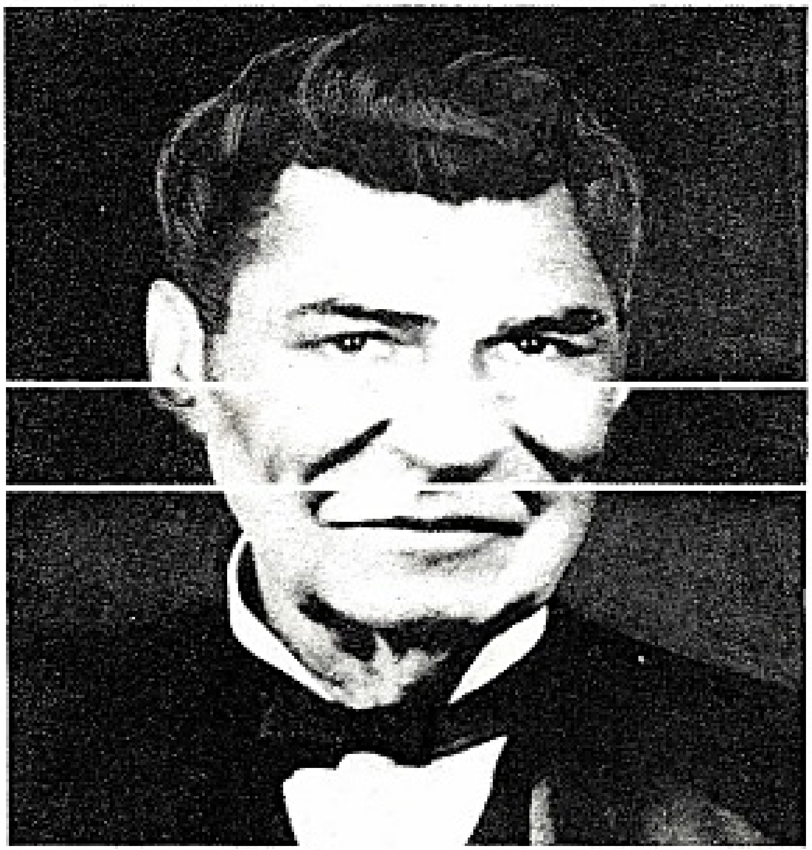
123

CASH PRIZES

for

Best Solutions





HERE'S your chance to win $750.00 or any one of the other 122 prizes in this big $1,750.00 cash contest. The contest is simple enough for anyone.

Hidden away in the three scrambled pictures on these pages are the photographs of three prominent men. You have seen their faces displayed often in newspapers and magazines. They are leaders in the field of science, industry, aviation, sports, and exploration.

All you have to do is cut the pictures on the white lines and reassemble them in their proper order. Identify them and follow the rules on the next page.

In all, nine scrambled photographs will be published. Do not send in your entries until all nine have been published. Do not ask the Contest Editor for further information. All the information you need to win a prize in this contest is published on these pages.

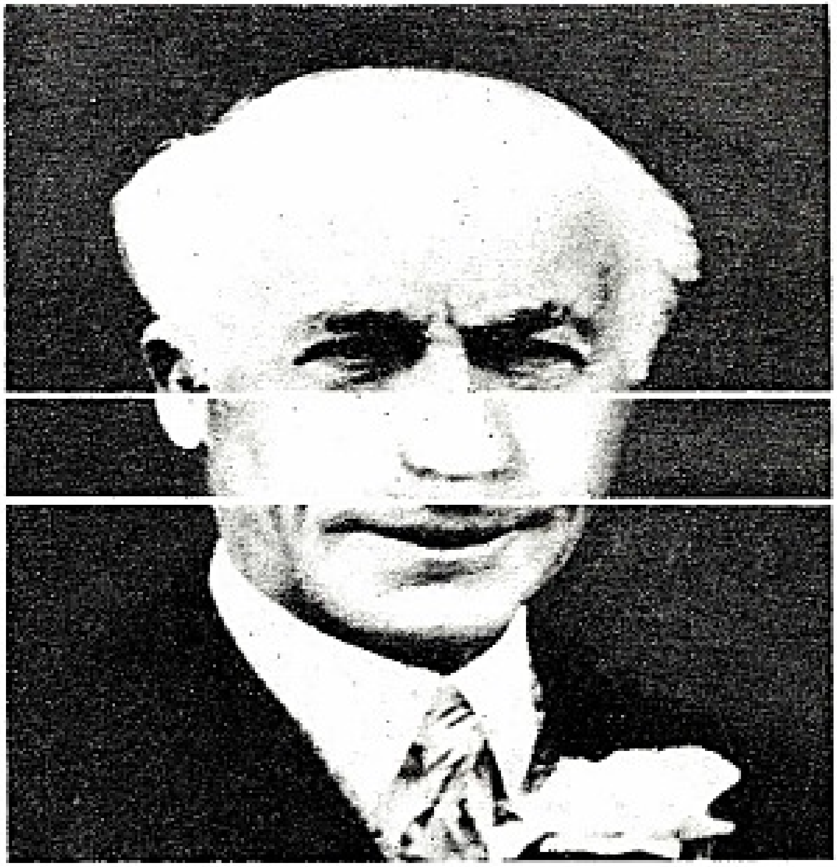
The three scrambled photographs published this month can be assembled into three likenesses of prominent men. To assist you, here are some tips to their identification: One of them is a leader in the automobile industry; another was one of the most popular sports champions in this country; and the third was a world-renowned inventor.

To be eligible each entry must include answers to questions on the next page and a slogan of ten words or less. The slogan should describe this magazine. Here is an example "Everybody's Magazine of Modern Science and Inventions." This slogan, of course, cannot be used by contestants.

$1750.00 CASH Contest

THE PRIZES

First prize	$750.00 IN CASH
Second prize	300.00 IN CASH
Third prize	100.00 IN CASH
10 Fourth prizes	20.00 EACH
10 Fifth prizes	10.00 EACH
50 Sixth prizes	5.00 EACH
50 Seventh prizes	1.00 EACH
TOTAL—123 PRIZES	$1,750.00 IN CASH



ANSWER THESE QUESTIONS

1. What is your age and occupation?
2. Do you live in an apartment, house, or on a farm?
3. What is the approximate value of your shop tools?
4. What tool or power equipment do you plan to purchase next for your home shop?
5. Approximately how much do you spend each year for lumber, paint, and hardware? List each separately.
6. Do you read any other magazine containing home workshop projects?
7. Are you interested in projects devoted to (a) metal working, (b) wood working, (c) electricity and radio, (d) model making, (e) chemistry, or (f) photography?

THE RULES

1. Cut out the three sections in each scrambled photo. Reassemble the parts in their proper order to form photographs of prominent men or women.
2. Paste each assembled photograph on a sheet of paper. Identify these men or women by name and tell, in 25 words or less, the part each played in his or her particular field of activity.
3. DO NOT MAIL YOUR ENTRY UNTIL ALL NINE SCRAMBLED PHOTOGRAPHS HAVE BEEN PUBLISHED. Three more photos will be published in the December issue and the final three scrambled pictures will appear in the January issue.
4. Copy and answer the questions listed above and submit them with your entry. Your replies to these questions will not be considered by the judges in awarding prizes, but to be eligible each entrant MUST answer the questions.
5. In ten words or less write a slogan that in your opinion best describes Modern Mechanix and Inventions Magazine. Slogans are to become the sole property of Modern Mechanix Publishing Co.
6. This contest is open to everyone except employes of Modern Mechanix Publishing Co., and members of their families.
7. You don't have to buy a copy of this magazine or be a subscriber to enter this contest. Recognizable facsimiles of the photographs will be considered by the judges.
8. Contestants need not submit elaborate entries. Neatness, brevity, and accuracy will be the deciding factors. No entries will be returned.
9. The editors of Modern Mechanix and Inventions Magazine will be the judges. Their decisions are final. In case of ties duplicate prizes will be awarded.
10. Mail your entry to Contest Editor, Modern Mechanix and Inventions Magazine, Minneapolis, Minn. Write your full name and address clearly. Entries must be postmarked on or before Jan. 3, 1936. Winners will be announced as soon as possible after the close of the contest.

Jimmie Doolittle ANSWERS YOUR QUESTIONS about

EDITOR'S NOTE—*Though one of this country's most famous flyers, Jimmy Doolittle is not just another stunt pilot. If you would become an aviator, heed these words of a pilot who has studied as well as stunted—who has followed his own advice.*

Born in Alaska, Jimmy has had a varied life as prospector, boxing champion, war ace, army aviation expert, test pilot, and air adventurer. Audaciously fearless, he has "twisted" the wings off many an untried plane by his breath-taking test dives, and was the first to fly across the treacherous Andes.

By air mass analysis, airline meteorologists, in constant touch with planes by radio, predict weather 48 hours ahead.

Q. WHAT do you think, Mr. Doolittle, about aviation as a career for a young fellow to follow?

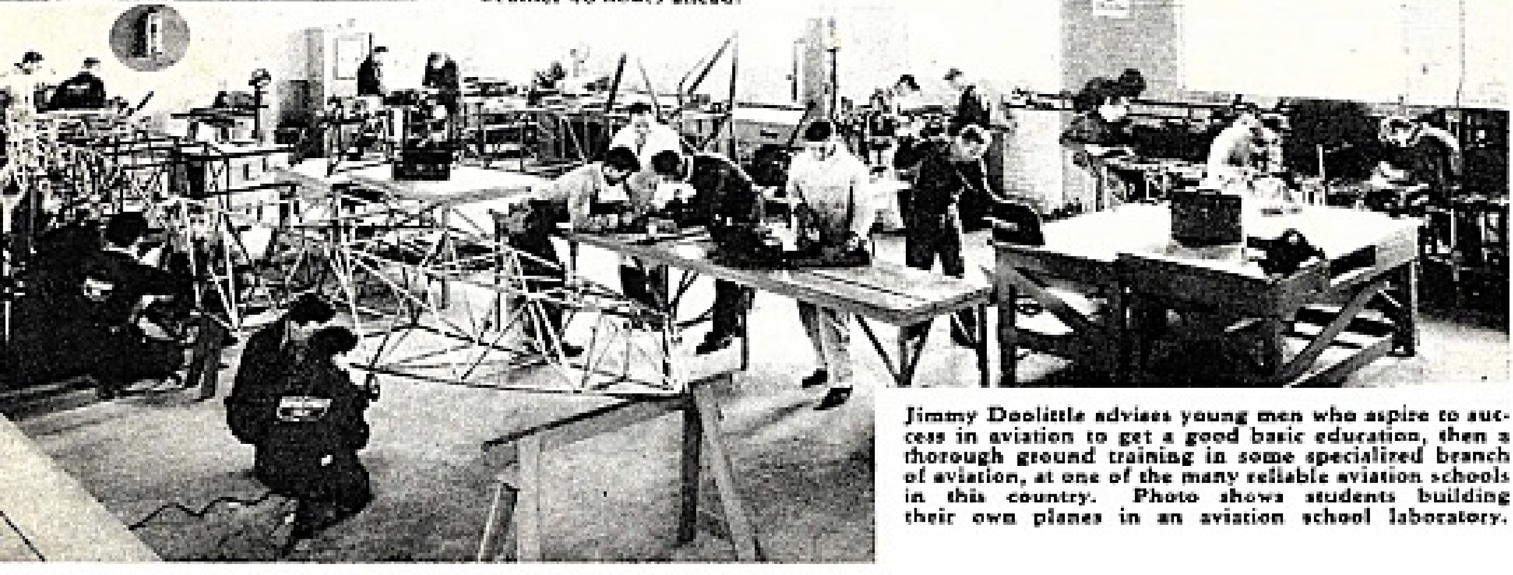
A. Looks good to me. It's a *young* man's game—good thing to get into and grow up with. There was a time when railroading was the thing. When autos came out, that was the place for the young fellow. Now it's aviation—and will be, as far as I can see, for a good long time to come.

Q. What would be your advice to a young fellow thinking of getting into aviation?

A. First, he should get a *good basic education.* Piloting should be secondary, an avocation rather than a vocation. To be successful he must be thoroughly grounded in some special branch of aviation.

Q. Is that because aviation is more complex nowadays?

A. Not altogether. It used to be when a fellow thought of "going into aviation" he meant that he was going to take some flying lessons and become a pilot. Much of the glamor has gone out of flying now, and the fellow who goes into it with that in his mind is headed for disappointment. To be only a pilot is rapidly becoming comparable to being



Jimmy Doolittle advises young men who aspire to success in aviation to get a good basic education, then a thorough ground training in some specialized branch of aviation, at one of the many reliable aviation schools in this country. Photo shows students building their own planes in an aviation school laboratory.

AVIATION

Questions by
RALPH BAKER
Answers by
JIMMY DOOLITTLE

Did you ever wonder if airplanes will ever become as common and safe as autos, if Diesels would be used in planes, or if the next war will be in the air? Here are all the answers—by aviation's expert.

A recent photo of ever-smiling Jimmy Doolittle, taken in flying togs with parachute strapped on.

Will light planes like this 1935 Aeronca become as common as automobiles? Read Mr. Doolittle's interesting answer.

For every mile plane speeds are increased, a new safety feature is developed. Here are the "stop and go" lights—red and green—used by airport officials to prevent accidents when many planes are landing or taking off at same time.

the engineer of a train, or the driver of a car or bus.

Q. Then just what should he do?

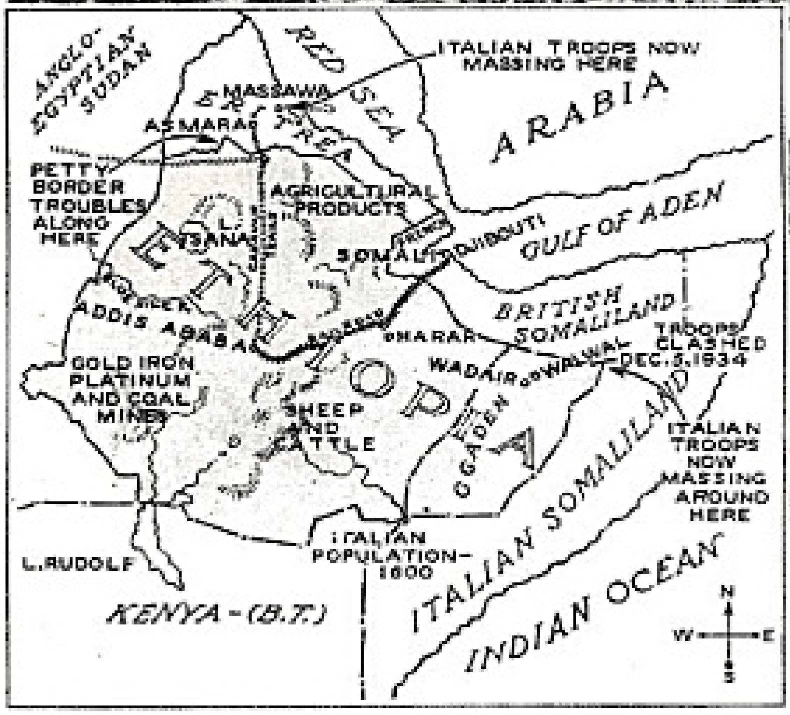
A. If he wants to get ahead, he should study some *specialized* branch—engineering, maintainance, designing, operations—and piloting. Whatever he takes up, he can advance if he has a good thorough background.

Q. How do you think the airplane stands in relation to other methods of transportation?

A. Well, the airplane is just about the safest, most comfortable and fastest means of

Can MODERN WEAPONS

Modern science contributes chemical fire to aid the Italian army, but overhead will be a fierce African sun to aid the Ethiopian tribesmen in battling the unacclimated invaders.


ANGLO-EGYPTIAN SUDAN
RED SEA
ITALIAN TROOPS NOW MASSING HERE
ARABIA
MASSAWA
ERITREA
ASMARA
PETTY BORDER TROUBLES ALONG HERE
AGRICULTURAL PRODUCTS
L. TSANA
FRENCH
SOMALI
DJIBOUTI
GULF OF ADEN
ETHIOPIA
ADDIS ABABA
BRITISH SOMALILAND
HARAR
TROOPS CLASHED DEC. 5, 1934
WADAIR
WALWAL
GOLD IRON PLATINUM AND COAL MINES
SHEEP AND CATTLE
OGADEN
ITALIAN TROOPS NOW MASSING AROUND HERE
ITALIAN SOMALILAND
ITALIAN POPULATION—1600
L. RUDOLF
KENYA-(B.T.)
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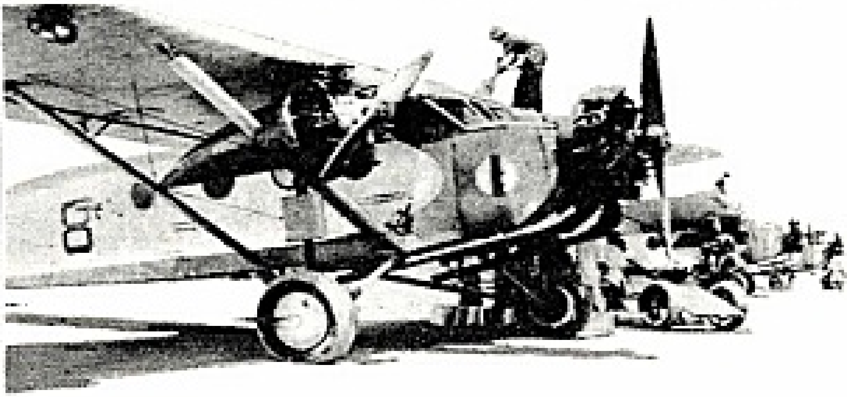
Ethiopia, with her vast mineral deposits and fertile plateau, effectively divides Italian Somaliland from Eritrea, Italy's other possession in Africa. Mountains form Ethiopia's forts.



These Italian planes, shown being overhauled after their arrival in Italian Somaliland, can attack swiftly, but Ethiopia is barren of landing fields and has few vital spots.

THE eternal battle between science and the elements will receive its supreme test in Italy's impending war with Ethiopia. Nature, which has enabled this oldest of kingdoms to maintain its independence against the inroads of the civilizing but exploiting white race, will be on the side of Haille Selassie's dusky warriors; and it is against nature that Mussolini's troops, armed with the latest death-dealing weapons, must pit themselves.

Italy already occupies two narrow strips of lowland bordering the Red Sea and Indian Ocean—Eritrea and Italian Somaliland. It took Italy seven years to conquer the former and twenty years to occupy the latter. The climate of both of these colonies is hot. They are steaming fever-ridden pest holes in the rainy season and almost waterless deserts in the dry. Of so little economic value are they that only 7,000 Italians reside there in normal times.

The highlands of Ethiopia, on the other hand, are fertile and temperate, and well suited to European habitation. Forming a barrier between the existing Italian colonies and the land Mussolini covets is, however, the Ogada district—an almost waterless, but rocky desert, 500 miles long and nearly 300 wide. This area is cut up with arroyos and crags, and is almost covered with a scraggly undergrowth so dense that it is seldom that vision can extend more than a quarter of a mile.

It is this vast Ogada desert, which Mussolini's troops must cross to obtain their objective, that has protected Ethiopia before, and upon which the warriors of the King of Kings expect to check the Italian hordes.

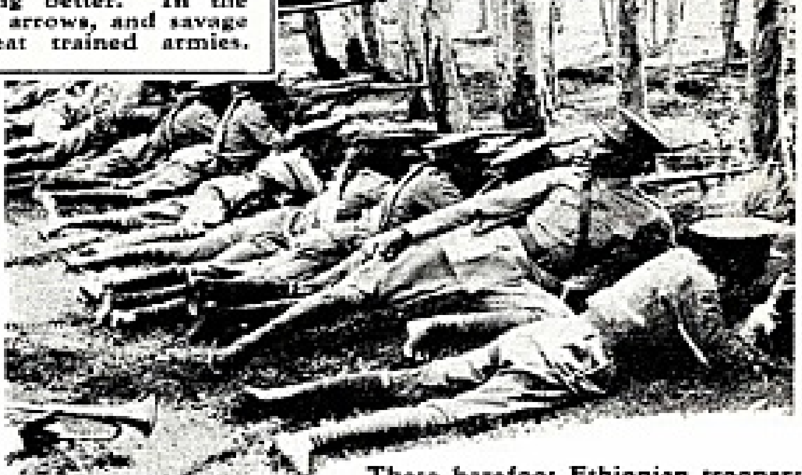
Conquer Ethiopia?

by
ROBERT W. GORDON

Bridges such as shown on left would be of no use to modern armies, though the tribesmen above, sworn foes of Italy, need nothing better. In the wilderness, spears, arrows, and savage instinct may defeat trained armies.

This country is absolutely without roads, railways, or water transportation, while every bush and rock can shelter a brown-clad Ethiopian. It was on this craggy plateau that Menelik massed 150,000 warriors to completely annihilate an Italian army of 12,000 at Adowa in 1896.

The Ethiopians are not organized as are European armies. Each tribal chieftain furnishes his own warriors upon call from Haille Selassie who can legitimately call himself the King of Kings because these minor kings accept him as their leader. Practically every man of the 3,000,000 Amharas is a fighter by choice and by habit, for the keeping of the seven million negroes and other lowland tribes in subjugation has given them continuous practice. These Amharas are of the Semetic race, closely allied to the Arabs and Riffs, long noted for their valor and love of independence. Every man has possessed firearms from his earliest childhood, and all are expert shots, with the frontierman's ability to find cover and to shoot only when every shot will be a hit. About 50,000 of the best of these have been trained in the use of modern weapons by Belgian officers.



These barefoot Ethiopian troopers are well drilled in modern war.

The problem of supply for the Ethiopians will be minor. Operating in friendly territory, used to living on rations so meager that a European soldier would starve, eating his meat raw from choice, and with his women folks packing the few necessities on the family mule, the Ethiopian army will be absolutely independent of a line of communications, and will thus possess a mobility impossible to a modern army.

The Italian army, on the other hand, will be pitifully dependent upon keeping an unbroken line open to the rear—from the firing line to Italy. Food, clothing, ammunition, medical supplies, and even water, will have to be transported by truck, wagon or mule

[*Continued on page* 140]

Radio Amateurs to the Rescue

CQ CQ CQ QRR QRR QRR

Radio amateurs more than 10,000 miles away anxiously listened for CQ's (general inquiry call) from this station. Guy Hutcheson is the operator at the set which went to the Antarctic with Admiral Byrd's second expedition. Amateurs handled messages from Byrd's men to U. S. relatives.

During disasters radio "hams" come to the rescue. They keep in touch with lonely outposts, with explorers, and like sentinels in the night guard against death.

WHEN a roaring hurricane swept through Florida in September, unknown amateur radio operators became heroes in the midst of death and destruction. Through howling wind and pelting rain they tapped away on their low-power transmitters when telephone, telegraph, and powerful broadcasting stations failed.

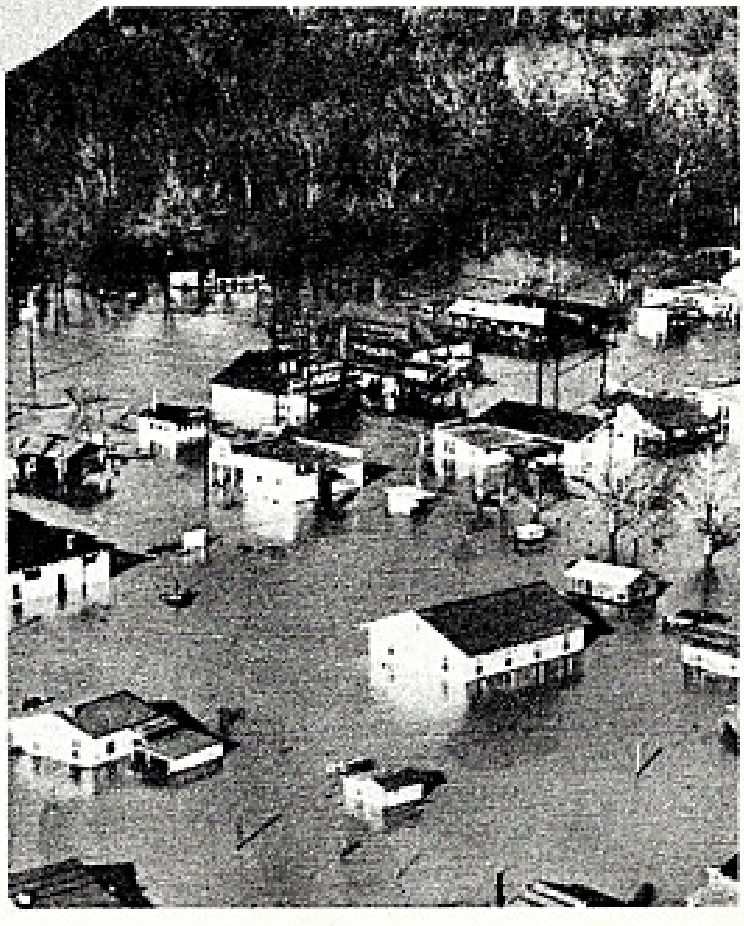
Their dots and dashes—the language of the radio amateur—hurtling through the ether flashed to the rest of the world news of the disaster and set the great task of relief into motion.

For twenty-three hours, while buildings crashed around him, Fred E. Bassett, Jr., of Eustice, Fla., described scenes of horror and gave directions for relief over his 50-watt portable transmitter, W4AKI.

In Miami, Alonzo O. Bliss, Jr., operator of W4COT picked up the messages and relayed them to Red Cross and army relief workers. Other amateurs in the hurricane area also carried on heroic work wherever it was possible to erect emergency transmitting equipment.

Death by storm, flood, earthquake, and disease is foiled by the ever-watchful radio amateurs. When other means of communications fail, they leap into the breach. Their emergency call, QRR, often restores the link of intelligence over which the work of relief and reconstruction is carried on.

All amateurs are advised to have emergency equipment in readiness for disaster. In the upstate New York flood last July amateur radio stations again came to the rescue. They sent out messages from survivors to anxious relatives outside the flood stricken area. They hunted down missing persons, lost transport planes, and sent out descriptions of road and bridge conditions in their vicinity, so that relief parties could reach the injured and marooned as quickly as possible.



DeSoto, assistant to the secretary of The American Radio Relay League, relates in accompanying story how amateurs assisted in rescue work in last summer's midwest floods.

in FLORIDA HURRICANE

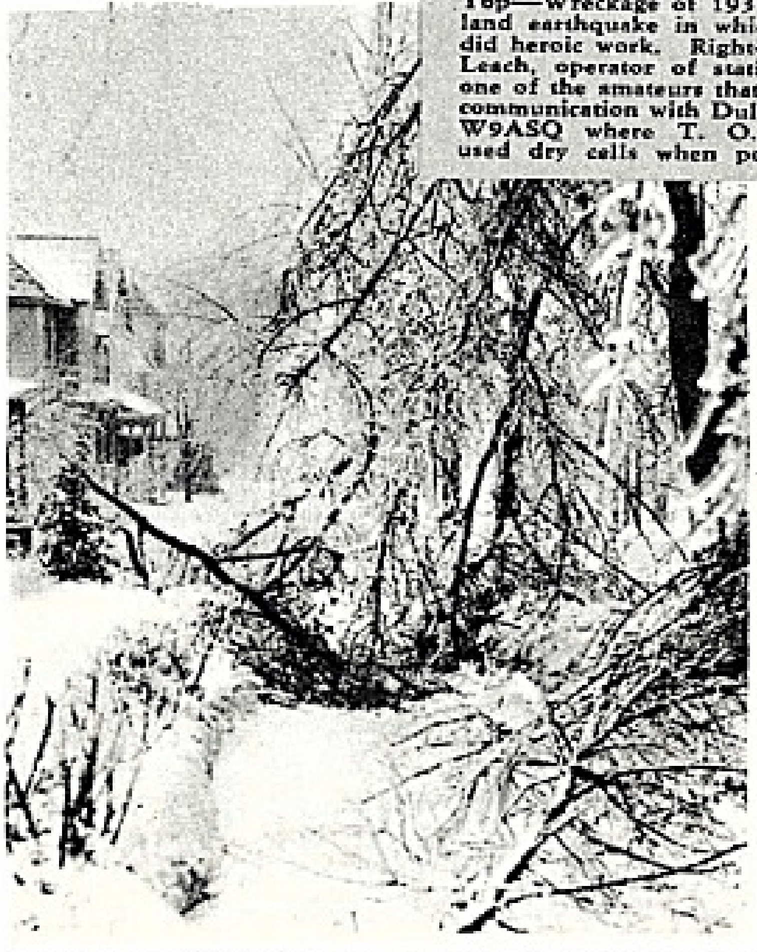
by CLINTON B. DE SOTO

When floods isolated many Nebraska towns early last summer destroying communication by telephone or telegraph, five radio amateurs, Lewis Cook, A. L. Cook, Bob Mitchell, Milan Kinsey, and Brick Early, loaded the transmitting and receiving sets of station W9FWW and the portable equipment of W9EKK on a truck and set out for the stricken area to aid in the rescue work.

At Pettygrove one of the stations was rigged up and stayed on the air continually for four days and nights handling important messages. The portable station was picked up by an airplane and flown to a hill near Oxford to establish the only means of communication in the flooded area. Later an airplane dropped a tent and other equipment to the amateurs during their long vigil.

Last spring a sleet storm swept down on Duluth, Minn., on the western tip of Lake Superior. The entire city was isolated. Lights, telephones, telegraph, radio broadcasting stations, all were made useless as hundreds of telegraph poles crashed under the weight of the sleet. Radio amateurs in the city immediately offered their assistance. They reached the outside world through fellow amateurs in Wisconsin and in Minneapolis and St. Paul.

Top—Wreckage of 1931 New Zealand earthquake in which amateurs did heroic work. Right—James H. Leach, operator of station W9BN, one of the amateurs that established communication with Duluth through W9ASQ where T. O. Jorgenson used dry cells when power failed.



Amateurs saved Duluth, Minn., *from* complete isolation when this sleet storm tore down all communication lines. They handled traffic for police, newspapers, railroads, business.

These amateurs aided railroad dispatchers in locating trains which were traveling through the area without orders in danger of serious accident; they sent out emergency calls for police and sheriffs; carried news bulletins for the press associations; and cleared important messages of the business and industrial world.

Not long ago from remote Alitak, an Alaska amateur radio flashed the urgent plea to save a life. In Seattle, early that Thursday morning, Ed Stevens, owner of amateur station W7BB, heard the call for help. He engaged

[*Continued on page* 138]

How to GUARD

Above—A dog enjoys tricks, and exercise is one of the best health measures for him. Right—Regular bathing not only keeps the dog in trim, but prevents infestation with fleas which carry worm eggs and sometimes cause the dog's death.

YOUR dogs' health is your concern, if you value him at all. He has no way of telling you when he is ill. Quite often he will force himself to play or follow your whims when he is actually seriously ill.

To give a complete diagnosis of each disease or attempt to prescribe a cure would hardly be possible in a limited space, but some of the symptoms of various diseases should prove helpful to the dog owner. If you feel that you have diagnosed your dog's case, you will find on the market a standard remedy for nearly every ailment. These remedies can be obtained in most drug stores and pet shops and are usually reliable when used according to directions. If there is any doubt in your mind as to the dog's ailment, do not fail to consult a veterinarian.

Worms no doubt are one of the greatest enemies of the dog, and especially the puppy. Most dogs have them at one time or another. There are several kinds of worms namely, the round worm, hook worm, whip, and tapeworm. The round worm is generally prevalent in puppies. A puppy will become listless and inactive, though he may eat voraciously. The necks and legs of worm-infested puppies are thin and their bowels are irregular. A diarrhetic condition may also be present. Vomiting is also a symptom. Invariably the eyes will contain matter.

Hook worms are thread-like in appearance and are about one-half of an inch long. They firmly attach themselves to the lining of the small intestines, which causes a slight bleeding. Puppies are very susceptible to these worms, especially in the South. Usually the appetite is good, the coat is rough and dull, and the skin may be scaly and reddened. There may be a cough and discharge from the nostrils. The dog becomes weak and emaciated and death soon overtakes him, un-

Your Dog's Health

by **EARL CRAIG**

If you value your dog and do not want to lose him, know the symptoms of diseases which endanger his life. The common ailments to guard against are covered in this article.

Running condition or lack of life in the eyes is a sign of ill health. Know your dog's features and expressions to recognize change.

The hunched, cramped appearance of dog at right is a sign of tapeworm. Often eczema appears in worm infested dog. Fleas carry the worms.

less he is given the proper care immediately.

The symptoms of whip worm, are similar to the others. The whipworm getting its name from its resemblance to a whip. This worm is from 1½ to 3 inches in length and usually can be readily detected in the droppings.

The symptoms of tapeworms vary considerably in the dog. Some may be infested with worms yet not lose flesh, but as a result suffer from eczema, which disappears when the worms have been expelled. As a rule a dog eats well, but has that tucked up appearance.

Tapeworms do not breed in the dog. The eggs or larvae must pass out of another dog already infested and be carried to another dog by an intermediate host. In the intermediate host they developed into cysts or bladder worms, and, if these in turn are swallowed by the dog, they develop into a tapeworm, therein completing a cycle. Fleas and lice act as intermediate hosts, hence the importance of keeping the dog free from these pests.

Several of dog remedy companies now have on the market worm medicines that rid the dog of nearly all worms at the same time.

If every dog owner would worm their puppies at least every two months until the age of one year, and then twice yearly, they would be well repaid.

In many cases dogs infested by worms have developed convulsions and running fits, frothing freely at the mouth, snapping at anything in their path and running blindly into objects. Usually the cry of mad dog is broadcast and the dog is killed. Proper worming would have saved him from an unnecessary death.

There are two forms of mange, sarcoptic and follicular. Both are caused by parasites and are very contagious.

Sarcoptic mange is the most common form of this skin disease and is recognizable by its scales or scabs on the skin.

Follicular mange differs in that the parasite buries itself in the skin of the animal and follows the hair follicles. The disease is slower in development, but gradually round bare spots appear over the body. Due to the deep burrowing of this parasite, the disease is usually incurable.

Eczema is a common skin disease and is more prevalent in long-haired dogs in the summer time. It is usually caused by im-

[*Continued on page* 118]

THREE MILES DOWN

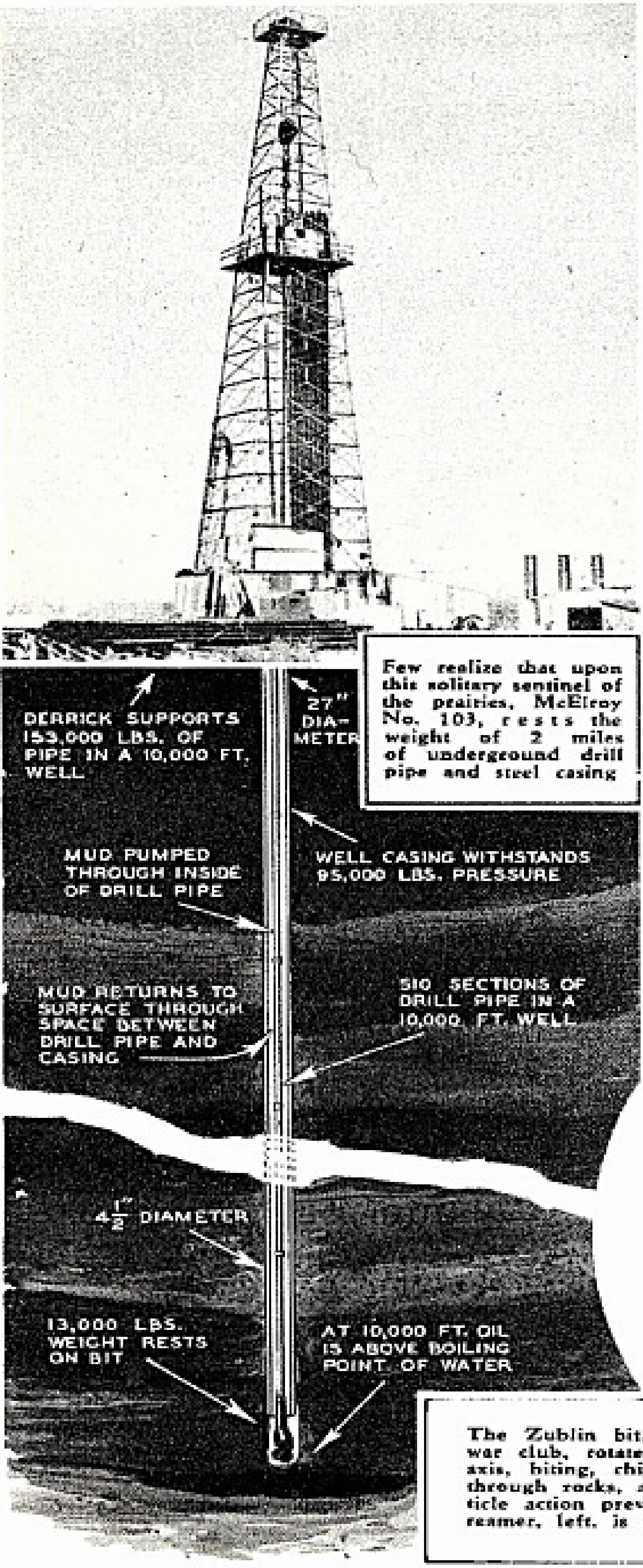
by KENNETH ERLING

THIRTY-FIVE thousand times longer than its diameter, a steel drill pipe snaked its way down a thin hole in Crane County, Texas, until the bit in McElroy No. 103 well bored into rock 12,786 feet below the earth's surface—newest and deepest hole drilled in the world-wide race to discover new oil fields.

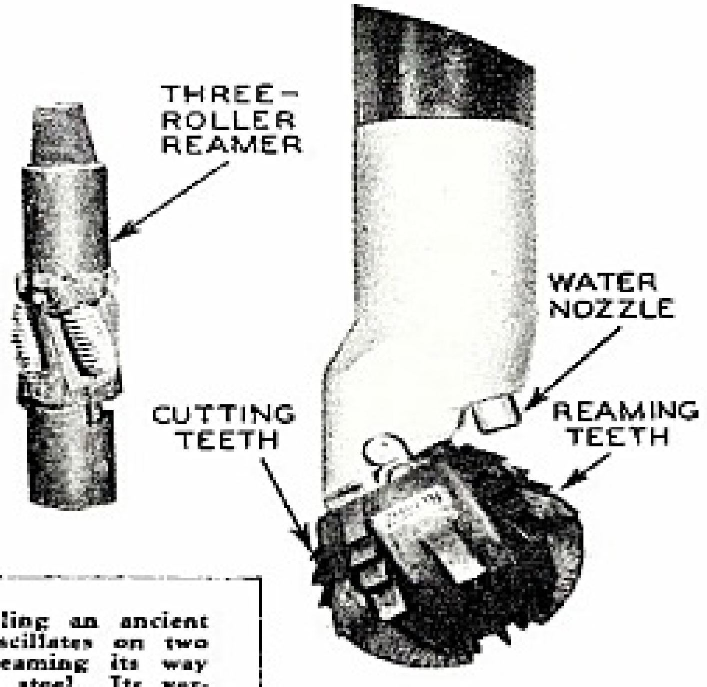
Records fell as the bit pushed on into oil sands never before penetrated. Into the first well to be drilled below 12,000 feet, McElroy No. 103, was run and cemented the longest string of pipe in the world. From its bottom came a core sample, two inches thick and a foot long, which gave geologists their first view of the earth's rocky interior nearly 2½ miles below the outer crust. During two years of drilling, at a cost approaching $400,000, not a major casualty resulted to delay operations.

Every year the bit goes deeper in the quest for black gold. Today 13 holes penetrate the earth 10,000 feet or deeper, seven having been drilled during the last two years.

Convinced that oil fields of the future underlie those of today, petroleum engineers everywhere are engaged in the race of deeper and deeper drilling. All sorts of physical and chemical tricks and mechanical novelties enter into deep drilling. Although the bit


Few realize that upon this solitary sentinel of the prairies, McElroy No. 103, rests the weight of 2 miles of underground drill pipe and steel casing

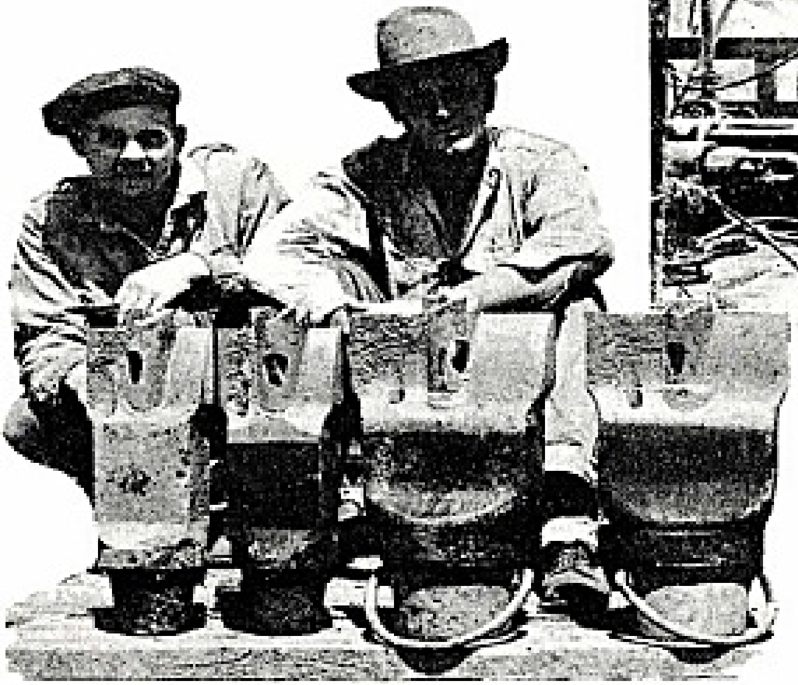
DERRICK SUPPORTS 153,000 LBS. OF PIPE IN A 10,000 FT. WELL
27" DIA-METER
MUD PUMPED THROUGH INSIDE OF DRILL PIPE
WELL CASING WITHSTANDS 95,000 LBS. PRESSURE
MUD RETURNS TO SURFACE THROUGH SPACE BETWEEN DRILL PIPE AND CASING
510 SECTIONS OF DRILL PIPE IN A 10,000 FT. WELL
4½" DIAMETER
13,000 LBS. WEIGHT RESTS ON BIT
AT 10,000 FT. OIL IS ABOVE BOILING POINT OF WATER


THREE-ROLLER REAMER
WATER NOZZLE
CUTTING TEETH
REAMING TEETH

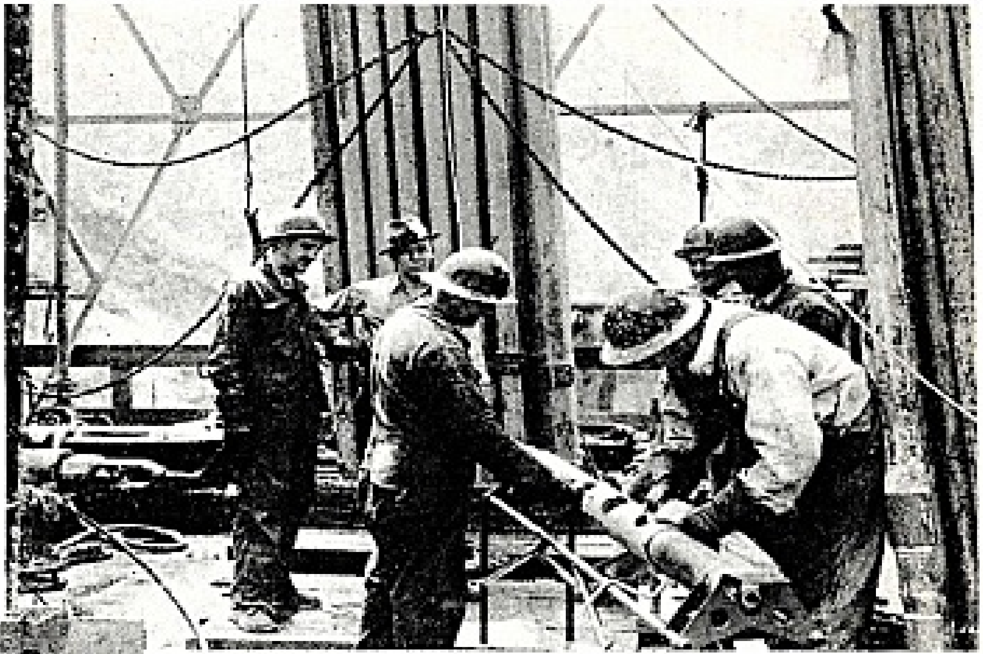
The Zublin bit, resembling an ancient war club, rotates and oscillates on two axis, biting, chipping, reaming its way through rocks, and even steel. Its verticle action prevents side drifting. The reamer, left, is used with fish tale bits.

in Search of BLACK GOLD

The future of present industrial methods may be three miles miles down in the bowels of the earth. As our oil supply dwindles, men go deeper in quest of the vanishing liquid wealth.



The fish tail bits of varying sizes shown here are used with rotary drills, and bore into rocks much like giant post hole augers. Reamers follow to keep the hole straight.



These oil workers are loading an underground cannon, preparatory to bringing in a well. The weapon is lowered to the bottom of the hole and detonated. High velocity steel bullets are discharged through the side perforations.

turns 200 times a minute two miles or farther down from the drill table, science gives the drilling crews accurate mental pictures of conditions throughout the depth of a hole.

Streamlined drill pipe and casing speed operations and reduce normal hazards. Recording thermometers reveal temperatures on the bottom. Clays and chemicals mixed with mud used to lubricate the bit and drill pipe and return cuttings to the surface perform feats of wizardry.

No matter how deep they go, holes are driven within a few feet of the desired place by use of delicate surveying instruments and deflecting devices. Electrical corers and loggers and movie cameras write the histories of all deep wells as clearly as though man could see the formations through which the bits bite their way to world record depths.

As the bits dig deeper into the earth they encounter tremendous pressures, caused by the weight of the earth's crust on rocks below, and heat which rises above the boiling point of water. Yet skilled crews keep the bits turning at the bottom of thin columns of mud, until at last samples of sand and rock reveal they have reached a new producing horizon.

Whenever a bit penetrates an oil-bearing sand deeper than any yet reached, a potential new oil field is discovered. Every one of the 13 deep holes has uncovered a new "field," despite the fact none of these was started with the intention of reaching new depths. They take on great significance, however, in view of the declaration of Prof. John F. Dodge of the University of Southern California, that. "present flush fields soon will become exhausted."

These deep holes are drilled by the "hydraulic rotary" process. This means that they are actually bored, much as an auger eats a hole through a piece of wood, by a bit suspended below a round table turned at varying speeds by steam, electricity or compressed air. As the drilling progresses ever deeper, the well must be kept "alive." This involves the hydraulic element.

The drill pipe to which the bit is attached turns inside a larger casing, made of tough steel. Mud is pumped down inside the drill pipe under high pressure, flows out through the bottom and returns to earth in the space between the drill pipe and casing. On its return journey the mud brings up cuttings ground away by the bit.

SPORTSMEN'S

TALK YOUR DUCKS

by OSCAR QUAM

Founder of a Noted Minnesota School of Duck Hunting

SPORT such as most hunters have never experienced awaits the sportsman who attempts to "talk his ducks into the bag."

Ducks are notorious talkers. A hunter can hear them gabbling among the wild rice patches as he cautiously creeps through the marsh to get within range. Or else he hears them quack derisively as they circle high over his blind. Most important of all, he hears one flock in the water telling another flock overhead, the "water is fine—come on in."

When the hunter hears that kind of talk, he sinks just a little lower in his blind, his eyes get brighter, and his muscles grow just a bit more tense as he waits for the flock above to circle lower for a landing. In his heart he wishes fervently he could talk the duck language himself.

Surprisingly enough, the task is easy, requiring only some practice, and the thrill of coming in with ducks literally talked into the bag more than compensates for the time spent in learning the lingo.

Many hunters who have heard of the thrills to be found in duck calling resolve to attempt it without first learning the tonal qualities most desired in an artificial call. They buy a low pitched call with much the same quality as that of a drake because the sound appeals to them. That is a mistake, as the drake does very little talking. During migration it is the female's high pitched voice that announces the discovery of a new feeding grounds, or welcomes new arrivals from the sky.

On a good duck call, the operator should be able to play the full scale, saying quack to

The end of a perfect day finds this hunter returning to his camp in Dorchester Co., Md., with a prized collection of canvas backs and two great Canadian honkers.

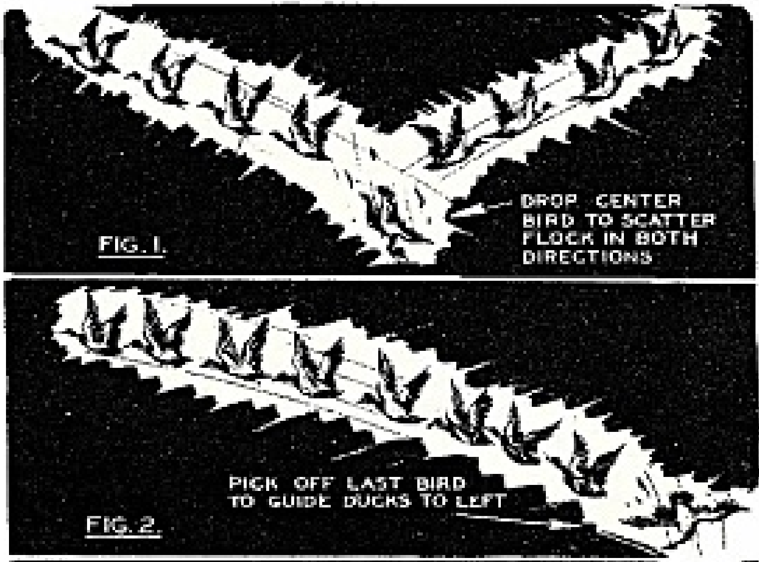


FIG. 1.
DROP CENTER BIRD TO SCATTER FLOCK IN BOTH DIRECTIONS
FIG. 2.
PICK OFF LAST BIRD TO GUIDE DUCKS TO LEFT
FIG. 3
SHOOT THIS BIRD TO SWING LINE TO RIGHT

Ducks almost invariably fly away from a falling bird. When ducks, lured by your call, head towards you in customary straight line formation, you can divide the flock by dropping center bird. To turn the flock to the left, drop the right end bird, and *vice versa.*

Into the BAG

The art of calling ducks is one that has been long neglected by the majority of hunters. Yet to those who "know the lingo," duck calling provides a thrill that can be experienced in no other way. This article tells how, why, when and where.

each note. Duck calls that do not have the full scale range are not effective enough for all around use. I prefer one with the barrel and stopper made of wood seasoned in linseed oil. Wood dulls the artificial tone of the call. The reed should be made of bronze as that is least affected by weather, and lasts a lifetime. To learn tone control, the beginner should practice the scale until he can get the "quack" inflection into each note perfectly.

After the scale has been mastered, the next step is to learn the mallard language. Mallard talk is the Esperanto of the dipper class of ducks which includes pin tails, widgeons, gadwalls, spoonbills and teal. The calls might be divided roughly into the feeding call, the come-back call, the greeting, the sociable pass-the-time-of-day call and the lonesome call. Of them all, the come-back call is the most valuable to know.

The call of the lazy hen, given mostly in the middle of the day, has only four notes drawn out in a tired manner. The lonesome hen call is very effective, consisting of

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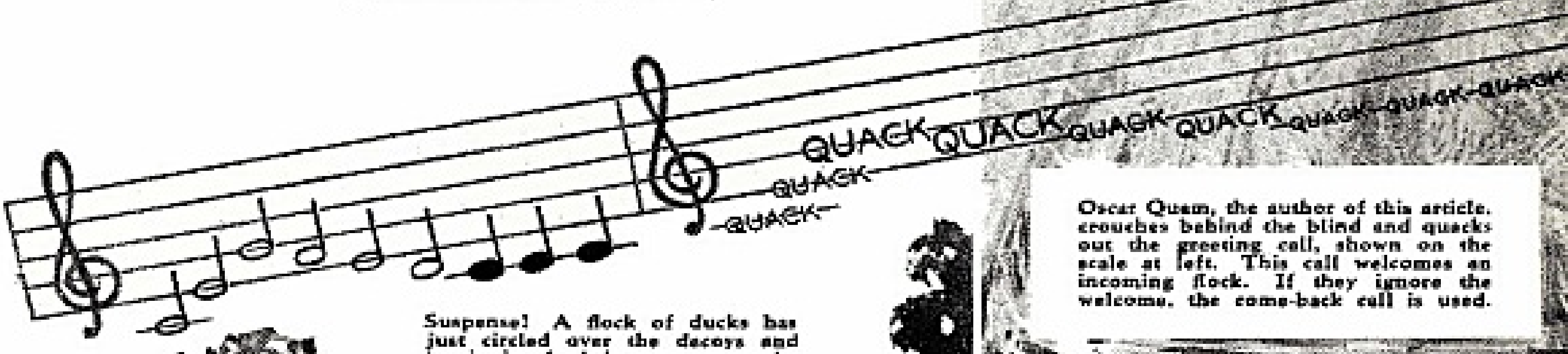


Oscar Quam, the author of this article, crouches behind the blind and quacks out the greeting call, shown on the scale at left. This call welcomes an incoming flock. If they ignore the welcome, the come-back call is used.

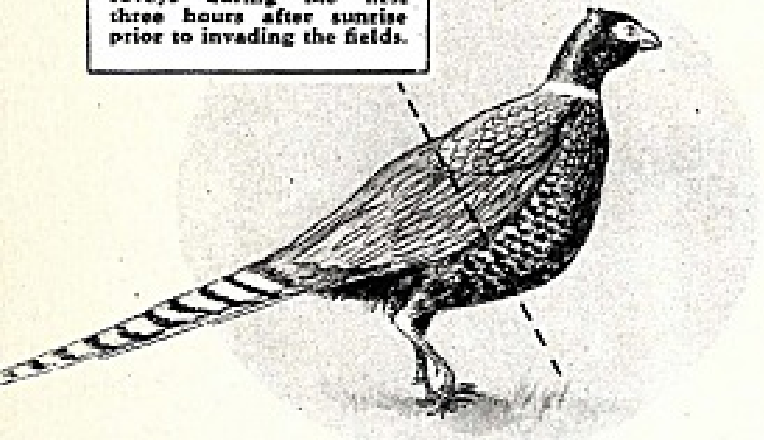
Suspense! A flock of ducks has just circled over the decoys and is winging back in response to the come-back call. This is the moment that brings a thrill to the most seasoned duck hunter, and gives novices buck fever and chills.

SPORTSMEN'S

MATCHING WITS

The ring neck pheasant matches a native cunning with the hunter's skill, and more often than not the hunter is second best. In this article, some of the wily bird's tricks are revealed for the first time.

Dawn of the opening day of the pheasant season finds this hunter silhouetted against the rocky margin of a dried up slough. Here the wily birds are to be found in coveys during the first three hours after sunrise prior to invading the fields.



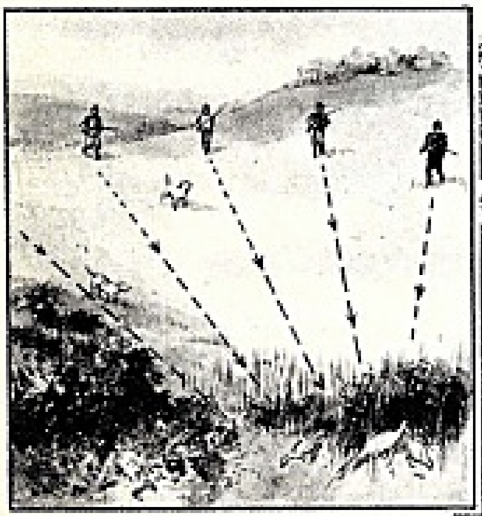
In spite of the pheasant's size, accurate shooting is necessary, as the vital organs are placed well forward. Any side shot to the rear of the line shown draws big burst of feathers, but the bird usually escapes.

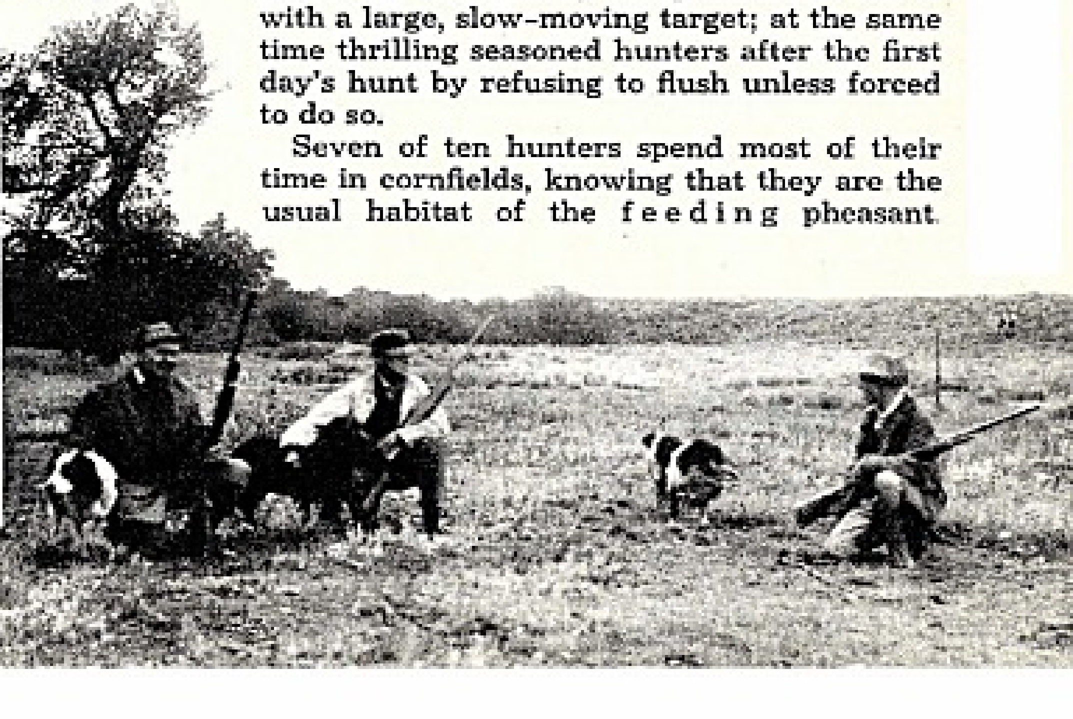
HUNTING the pheasant, America's most popular upland gamebird, cannot be reduced to a formula.

Formerly only a sport for kings—whose beaters would drive the birds past comfortable shooting boxes on large estates—the rise of the pheasant as an American game-bird has been almost wholly within the last decade. About twenty years ago American sportsmen, noting their hardy nature and the rapidity with which they reproduced, introduced them into this country to augment our dwindling supply of native birds.

During this time, they have propagated and spread in a wide band from lower California up through the middle-west and out to the east coast to assume the position of America's most universally hunted upland game bird. They have produced a new era in shooting, providing the green, inexperienced hunter with a large, slow-moving target; at the same time thrilling seasoned hunters after the first day's hunt by refusing to flush unless forced to do so.

Seven of ten hunters spend most of their time in cornfields, knowing that they are the usual habitat of the feeding pheasant.





Above—The "basket" drive, the hunters arranged in a semi-circle, gradually closing in on their quarry as the field narrows down. Right—As the dog brings in the results of the last drive, the hunters meet to discuss a likely spot for next foray.

CAMPFIRE with the WILY PHEASANT

by
MARVIN P. SPITTLER

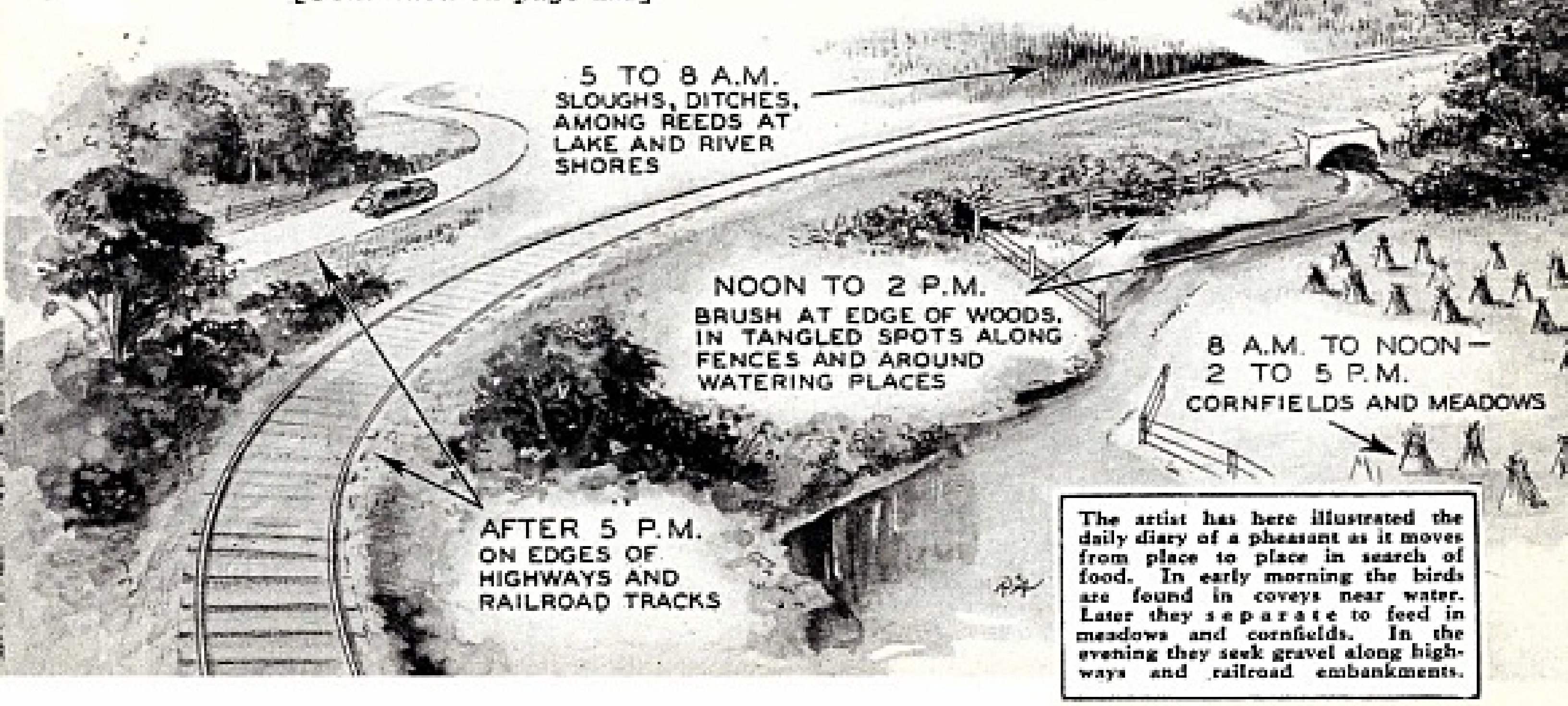
Those same seven hunters, granted that they start at dawn and stop at sunset, are wasting the hours between five a.m. and eight a.m., between noon and two p.m.—for they are hunting in cornfields where only a few hungry stragglers are feeding. For the pheasant, like the human, is a creature of most regular and precise habits when not driven too severely.

Morning usually finds him at home in dried-up sloughs, brambly ditches, or amongst the reeds around lake-shores and river-beds. Here, at the break of dawn is the hunter's best chance of the day to shoot his limit in a hurry, for rather than being scattered and feeding in the cornfields, they are concentrated in pairs and coveys, their acuteness somewhat dulled by the soundness of a night's sleep and the security of companionship. Whereas it is almost impossible to flush them here an hour after sunrise, they are often startled into a befuddled rise before that time.

The usual route of the pheasant in the morning leads to a place where he can get

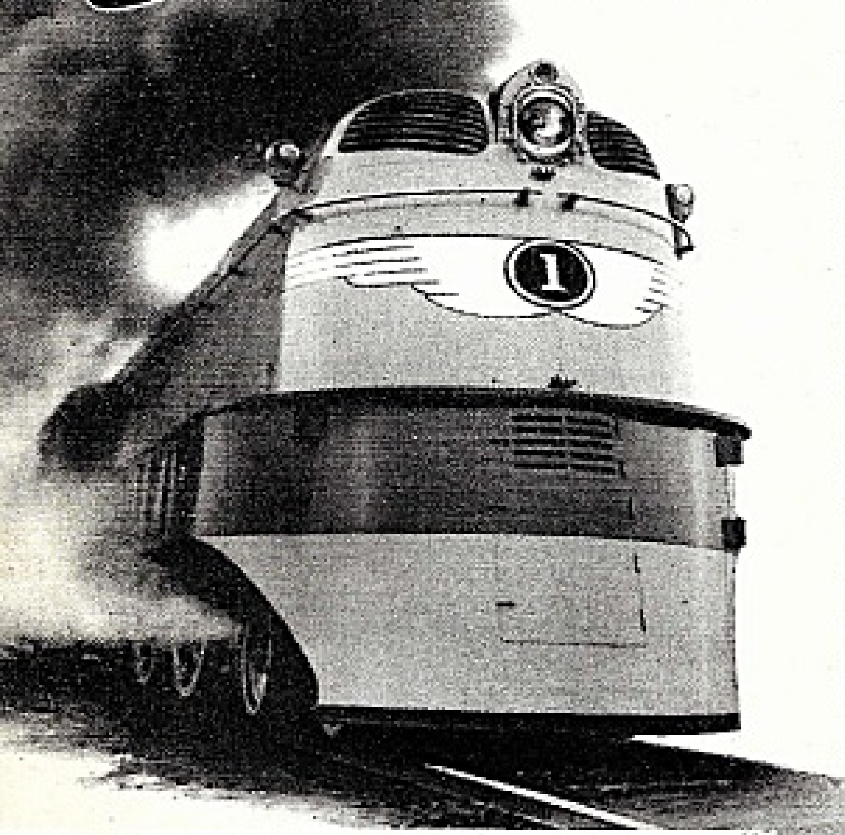
[*Continued on page* 122]

Success! This New Jersey sportsman pauses to inspect a fine cock pheasant his dog has just retrieved from the slough bottom. The dog approves.


5 TO 8 A.M.
SLOUGHS, DITCHES, AMONG REEDS AT LAKE AND RIVER SHORES
NOON TO 2 P.M.
BRUSH AT EDGE OF WOODS, IN TANGLED SPOTS ALONG FENCES AND AROUND WATERING PLACES
8 A.M. TO NOON—
2 TO 5 P.M.
CORNFIELDS AND MEADOWS
AFTER 5 P.M.
ON EDGES OF HIGHWAYS AND RAILROAD TRACKS

The artist has here illustrated the daily diary of a pheasant as it moves from place to place in search of food. In early morning the birds are found in coveys near water. Later they separate to feed in meadows and cornfields. In the evening they seek gravel along highways and railroad embankments.

Streamline BEAUTIES

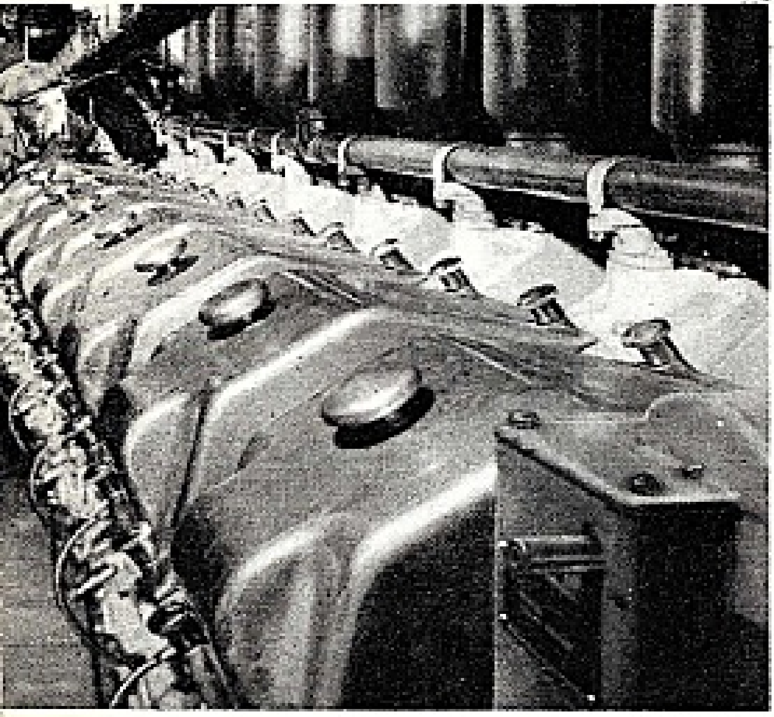


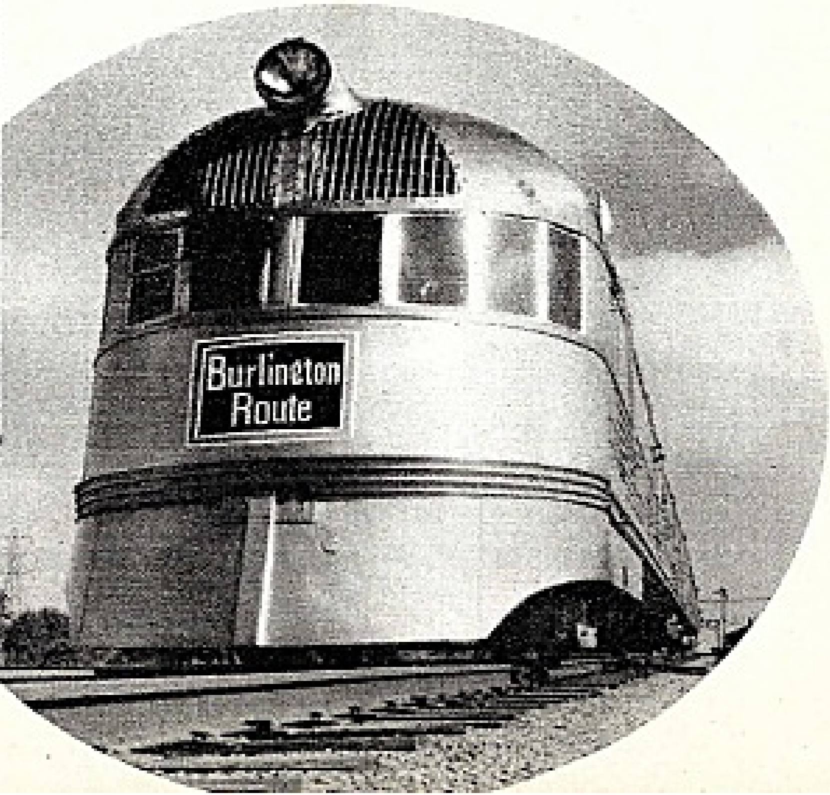
ROLLING along railways of the world at greater than mile-a-minute speeds, streamlined trains are conquering time and space in an attempt to keep the traveling public from deserting the rails for airplanes and motor buses.

Three choices have been offered to the jury of travelers—the ordinary steam train running on faster schedules, the beautiful Diesel-powered streamliner, and the light weight steam streamliner in its gleaming new dress of chromium and brass. A fourth contestant recently entered the picture—a turbine-drive steam locomotive that may surpass all others in speed, safety, and comfort.

Making its first trials on British railways is the turbomotive, popularly called the "hush hush" giant because of the secrecy which cloaked development work on the engine. No exterior working parts, two funnels, a radiator, and a high efficiency steam turbine drive make this train a radical departure from ever-conservative British design.

In answer to the challenge, "Are steam locomotives doomed?" S. A. Kraft, a St. Paul, Minn., mechanical engineer, designed the super-turbine train pictured on the cover of this issue. With drive wheels nearly as high as the train itself carrying the entire weight of the engine, there is no weight resting on wheels that produce no power. Independent





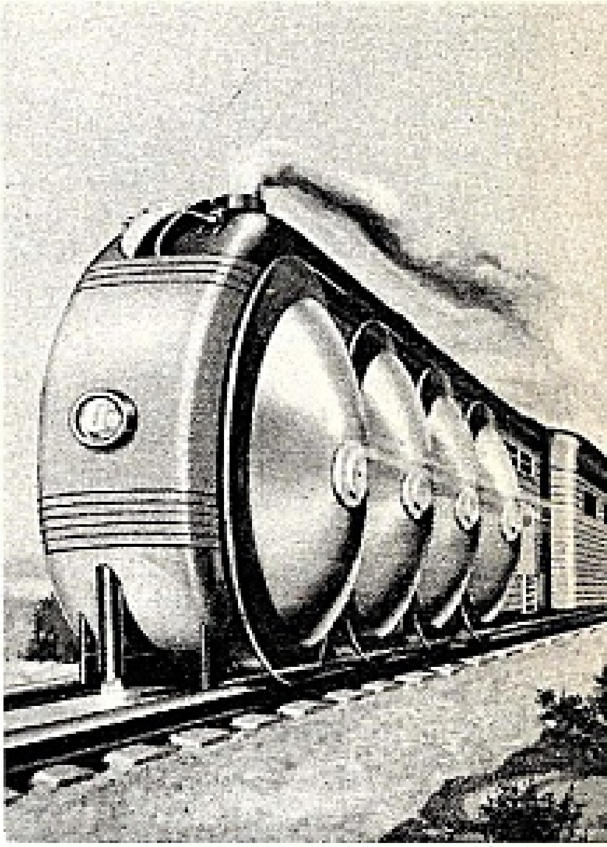
Two beauties challenge the Iron Horse for supremacy on the Chicago-Twin Cities route. Over this speedway of America race each day the streamlined oil-burning steam train *Hiawatha* (top), the twin *Zephyr* Diesels, one of which is shown at the right, and *The 400*, conventional, but improved, steam locomotive. Time schedules are about the same for each. The V-16 Diesel engine (above) develops 1,200 horsepower for the Union Pacific's *City of Portland*.

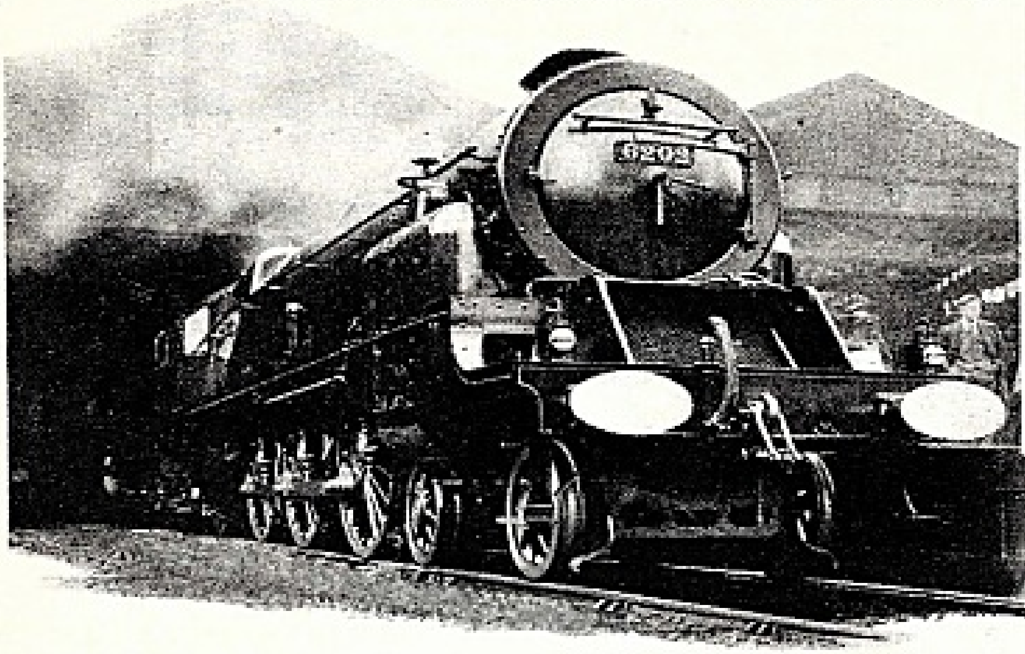
Lure TRAVELERS *to Rails*

drive for each wheel eliminates any drag in rounding curves.

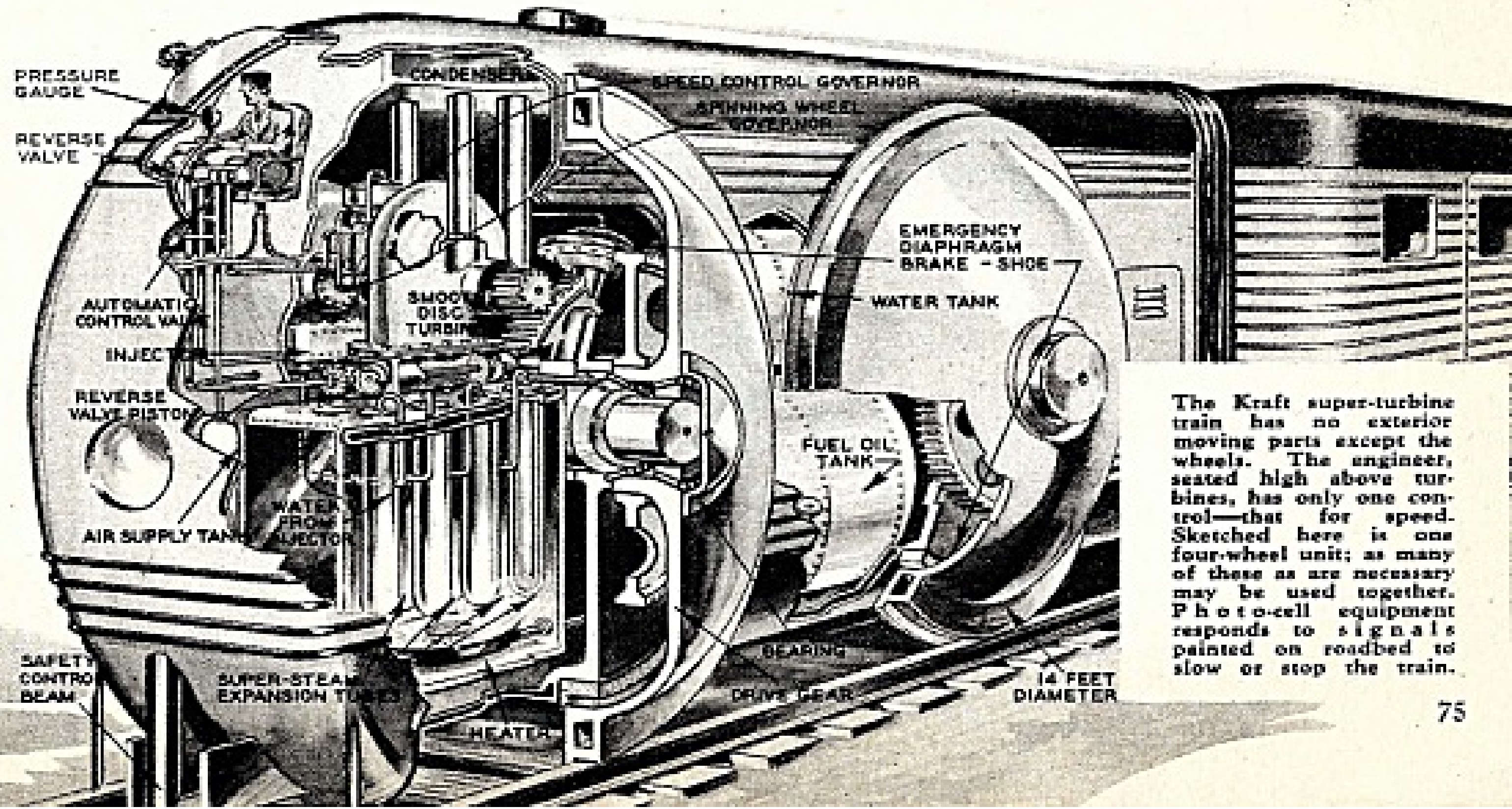
Geared to each of the wheels is a steam turbine having a perfectly smooth disc. Super-steam directed against this disc at terrific pressure exerts as much force as it would against vanes.

The roadbed itself is the only limit to the speed of this million-pound rail giant. Control is completely automatic, the engineer having only to set the single throttle to the desired speed. By a system of compressed air lines, valves are opened to admit steam to each turbine until the train reaches running speed, and brakes are



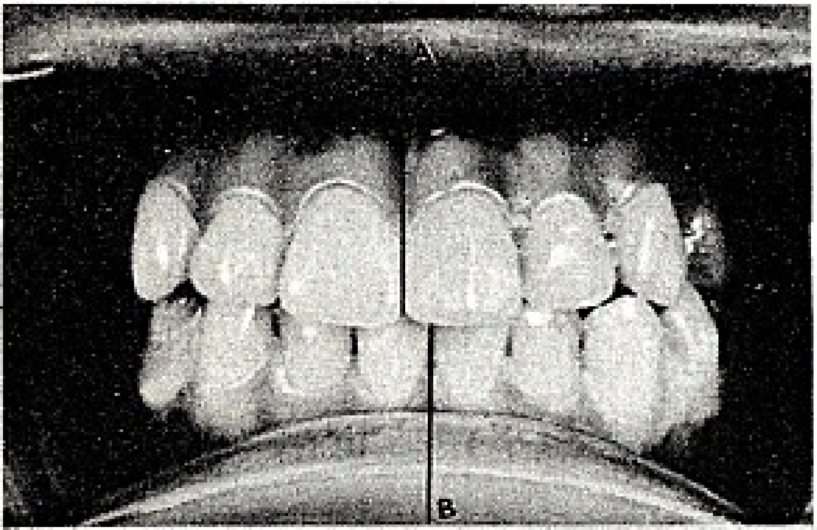


Shortly after British railways carried out first tests on the *turbomotive*, turbine-driven steam locomotive shown at left, S. A. Kraft, St. Paul, Minn., mechanical engineer, announced his design of the above super-turbine speed train.


PRESSURE GAUGE
REVERSE VALVE
CONDENSER
SPEED CONTROL GOVERNOR
SPINNING WHEEL GOVERNOR
EMERGENCY DIAPHRAGM BRAKE - SHOE
WATER TANK
AUTOMATIC CONTROL VAL
SMOOT DISC TURBIN
INJECT
REVERSE VALVE PISTON
FUEL OIL TANK
WATER FROM INJECTOR
AIR SUPPLY TAN
BEARING
SAFETY CONTRO BEAM
SUPER-STEAM EXPANSION TU
DRIVE GEAR
14 FEET DIAMETER
HEATER

The Kraft super-turbine train has no exterior moving parts except the wheels. The engineer, seated high above turbines, has only one control—that for speed. Sketched here is one four-wheel unit; as many of these as are necessary may be used together. Photo-cell equipment responds to signals painted on roadbed to slow or stop the train.

"CROOKED" TEETH--



Here is a fine set of teeth which their owner brushes twice a day, and yet they are slowly being ruined by the owner's habit of resting her chin in her hand. The pressure is causing the lower jaw to drift out of line.

Pictured here is the habit which is causing the teeth, shown on left, to drift out of alignment. The bone holding the teeth is easily distorted by constant pressure, with the result that teeth become uneven, chipped and irregular. However, it is this very softness of the bone which enables a dentist to realign the teeth.

Another bad habit common in both children and adults is that of resting the head against the knuckles of the hand. The habit is hard to break because few realize they have it.

IT DOESN'T seem possible that one could bend the hard bones of one's face by leaning face or chin on hand. Especially if you have sat at the ringside and seen some husky take a terrific wallop on his jaw without even blinking.

Bone in the prize ring and bone in the classroom are two quite different things. Adult bone is harder than a child's. But children's bone varies, also. Two youngsters for instance, may weigh ninety pounds each. One is three inches taller than the other; an effect of diet perhaps and of a ductless gland known as the pituitary. One has straight legs, while the ninety-pound weight of the other has bowed his legs. Deficient diet and perhaps deficient activity of the thyroid gland which controls the building of bones and teeth, are responsible. This child's bones—and teeth—are soft. The teeth decay readily and the bones bend easily. Moreover the bones are growing, and the growth is easily molded by pressure.

The gentle breezes of Southern California many bend a young tree; years later we see a giant Eucalyptus still bending as though before a light breeze. The twig was bent!

So the basic trouble when the child develops a crooked face or crooked teeth may be lack of calcium and phosphorous in the diet; a lack of vitamins or a derangement of the ductless gland functions.

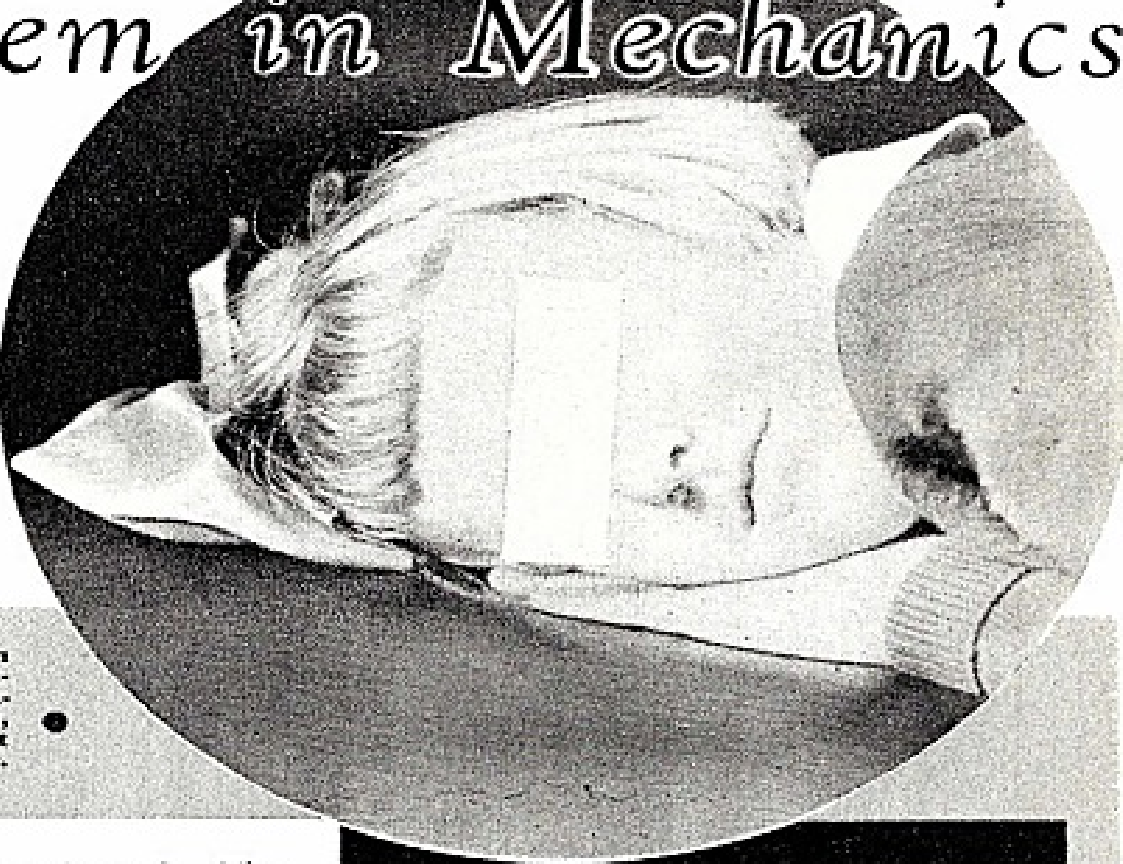
But the immediate cause of crooked teeth is usually some abnormal pressure. The pressure of the lip, if the child constantly draws it into his mouth and sucks it; the pressure of his thumb, if he sucks it; the pressure of his cheeks, and the lack of reciprocal pressure of the tongue from the inside, if he breathes with mouth hanging open; the pressure of chin or cheek in the cupped hand when reading, studying or "day dreaming"; all these will cause misplaced or "crooked" teeth.

Have you ever noticed that some folks'

a Problem in Mechanics

by
DAVID W. McLEAN, D. D. S.

EDITOR'S NOTE: *Dr. David McLean is Professor of Gnatho-dynamics of the Graduate Faculty of Dentistry at the University of Southern California.*

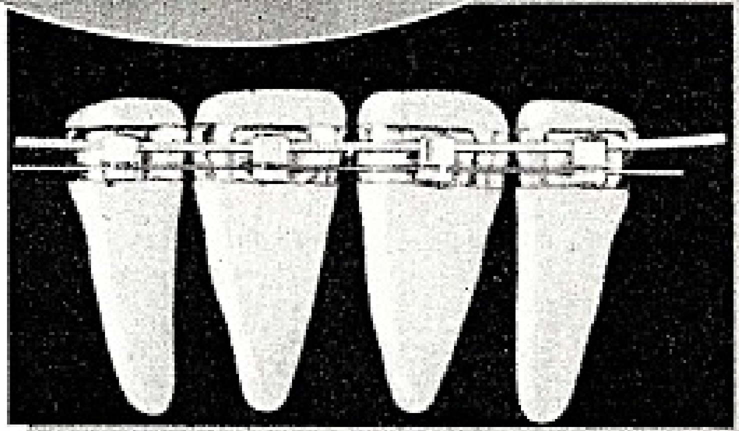


It is when you sleep in this position that teeth drift in the line of least resistance. Bone melts away under constant pressure, and when this happens, the dentist uses wire bands to direct the pressure back to normal center.

noses point southwest or southeast? The vertical line of many faces, beginning between the eyebrows and running down over the crest of the nose to the center of the chin, curves to right or left. Such an individual sleeps, or has slept, on his stomach—resting one side of his face on the pillow or on his hand or arm. Perhaps the pillow is between face and arm, but that doesn't keep the pressure from making the face crooked, the upper lip flat or the chin receding.

Receding chins are not caused by weak character. Strong mechanical pressure during the period of growth often warps the mold into which nature is pouring the concrete framework of the chin, jaws and face.

But bone isn't concrete. It is alive and growing. The hard dome of the skull is strong enough to stand the weight of the head during the hours of sleep, just as the dome shape of an egg enables it to stand pressure between the palms of your hands. But the bones of the face are thin, and for the most part, hollow. During childhood, while the temporary teeth are still in place, the permanent teeth are forming in hollow spaces in the bone above. Remove the outer thin plate of bone and you would readily see how faces can be warped out of shape and the teeth made crooked by unnatural pressure.



The upper wire in this photo can tilt the teeth from right to left, while the lower wire tips the roots inwards or outwards. The proper leverage is a delicate problem in mechanics.

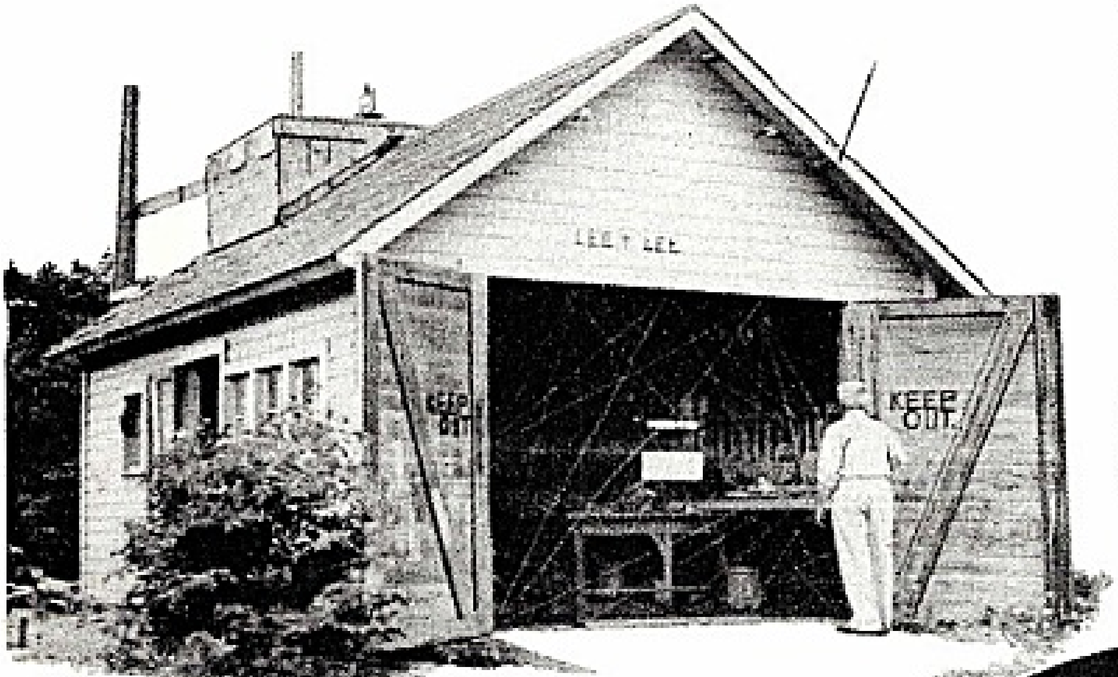
The breaking of the postural habits of children requires patience. The leaning posture is assumed in moments of relaxation or when the mind is busy with something else. Sleeping habits are elusive—difficult to catch. Often the youngster sleeps on his back during the early part of the night, and again when you go into his room in the morning; but through the middle part of the night, he turns face downward. Books piled up in bed on each side of him, or his pajamas pinned to the bed covers, so he cannot turn completely over, will usually break the habit, in time.

If pressure is continuous, it does more than warp the bone. It stimulates cells of microscopic size, in the flesh covering the bone.

[*Continued on page* 120]

Boy Genius Builds Complete

From odds and ends of discarded equipment 13-year-old Franklin Lee has built a remarkably complete scientific laboratory. A few of his many successful electrical projects are described in this article.



In this garage-laboratory Franklin Lee, Granite Falls, Minn., "boy-Edison," carries on his electrical and chemical research experiments. A network of charged wires keeps out the loiterers.

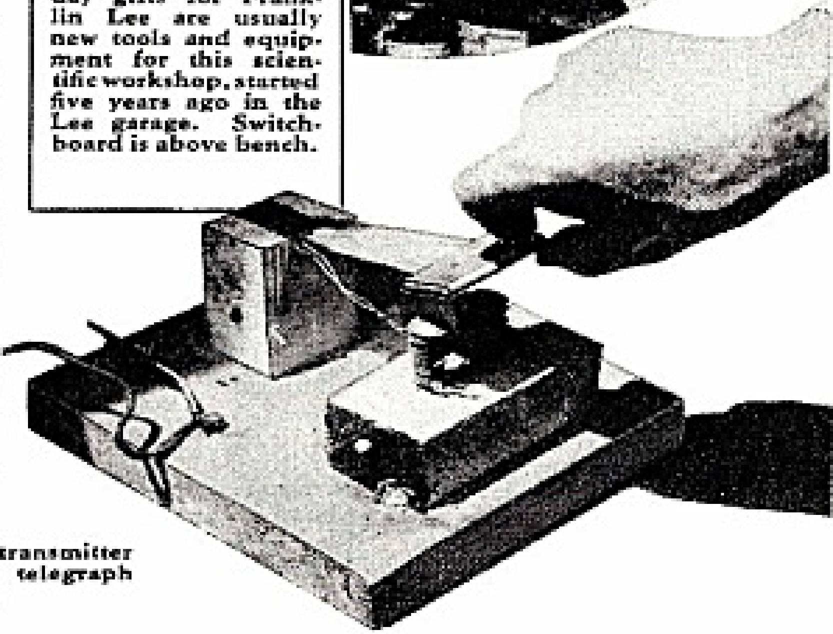
NIMBLE fingers, an inventive mind, and the urge to experiment have brought to 13-year-old Franklin Lee, Granite Falls, Minn., electronic wizard, a scientific research laboratory that would do credit to a college student of science.

In the well-lighted interior of his garage workshop powerful homemade electric motors turn lathes and grindstones. Standing by in one corner, ready for instant use, is an electromagnet capable of lifting a hundred pounds. Transformers of different sizes and voltages hum merrily in their baths of cooling oil, while in one corner metal glows white-hot in a homemade electric arc furnace. From discarded electrical equipment, auto parts, and odds and ends of cast-away materials Franklin built them all.

But Minnesota's "boy-Edison" is not strictly a scholarly type of boy. Invading nearby dumps and junk piles, he salvaged scraps for possible future use. Electrical devices, given to him by friends, were dismantled for the wire, bolts, nuts and screws. After completing and testing each electrical gadget, the youth would tear it down and build other experimental apparatus.

At ten, Franklin built his first successful

Christmas and birthday gifts for Franklin Lee are usually new tools and equipment for this scientific workshop, started five years ago in the Lee garage. Switchboard is above bench.



Complaints from neighbors put an end to Franklin's spark transmitter experiments. This is the key used in his early radio and telegraph projects—just nails, bolts, and a piece of spring steel.

Electrical Laboratory

by ORMAL I. SPRUNGMAN

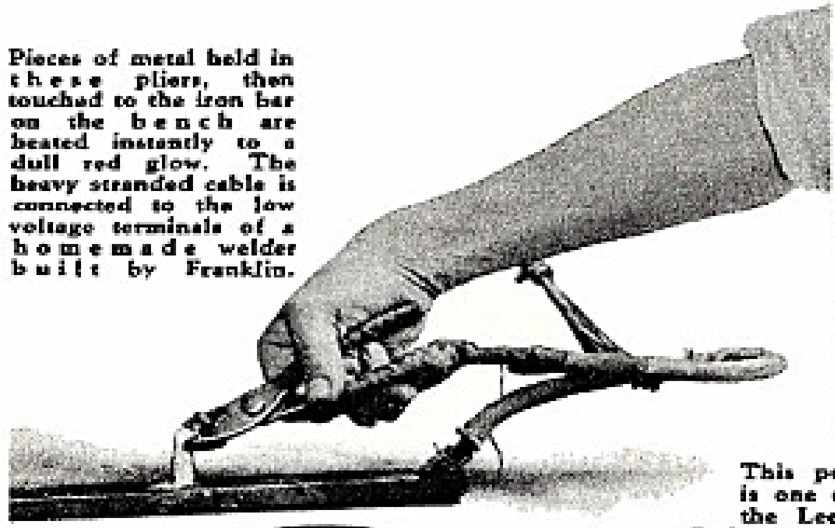
motor. Plenty of odds and ends went into the motor—watch parts, discarded scrap iron, a knitting needle for a shaft. He had to splice together short lengths of wire for the windings. The motor was of makeshift design, but *it worked.*

Many of Franklin's projects were far from mechanically perfect since he labored under difficulties, utilizing only the materials on hand. Everything that he has done or built, however, has been successful because he understands principles.

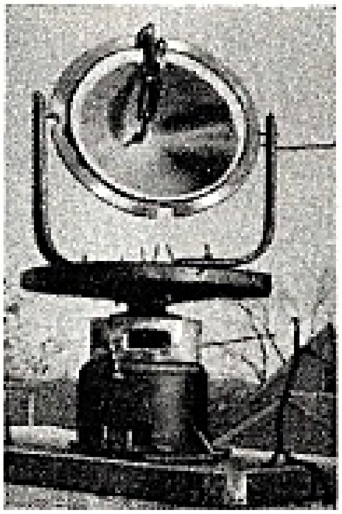
Franklin's collection of workshop tools grew as a reward for his hard work. Christmas and birthday gifts usually meant tools and new shop equipment. These he has mounted in appropriate racks along the walls.

When visitors call, he is unaware of their presence. He has had a number of helpers, but none seem to be able to follow his pace. The work is either too difficult, too dirty or too tiresome to interest his young friends. To ward off bothersome youngsters or curiosity-seekers, Franklin has covered the garage opening with a network of wire and hung up "Danger—High Voltage" signs. When the

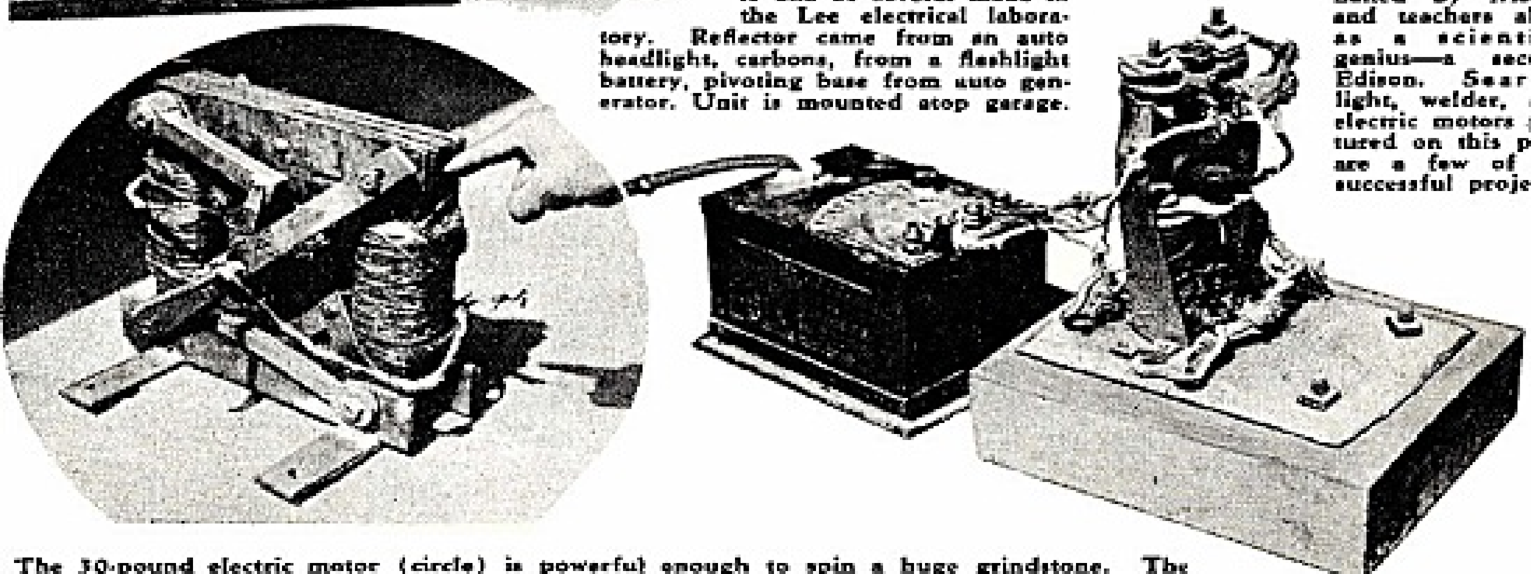
At the age of thirteen Franklin B. Lee of Granite Falls, Minnesota is hailed by friends and teachers alike as a scientific genius—a second Edison. Searchlight, welder, and electric motors pictured on this page are a few of his successful projects.



Pieces of metal held in these pliers, then touched to the iron bar on the bench are heated instantly to a dull red glow. The heavy stranded cable is connected to the low voltage terminals of a homemade welder built by Franklin.

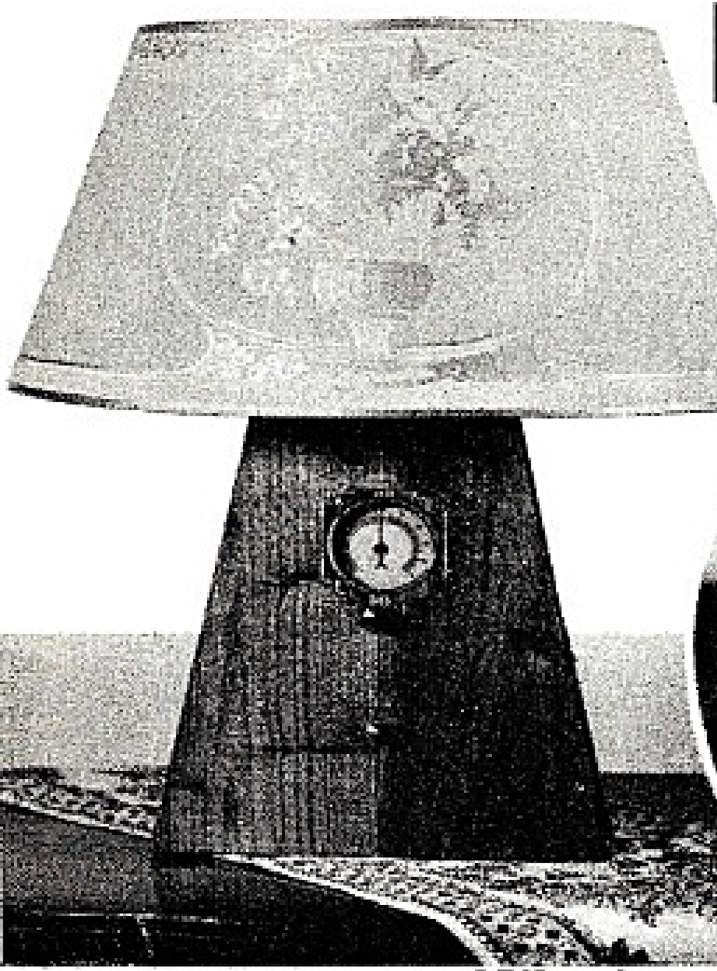


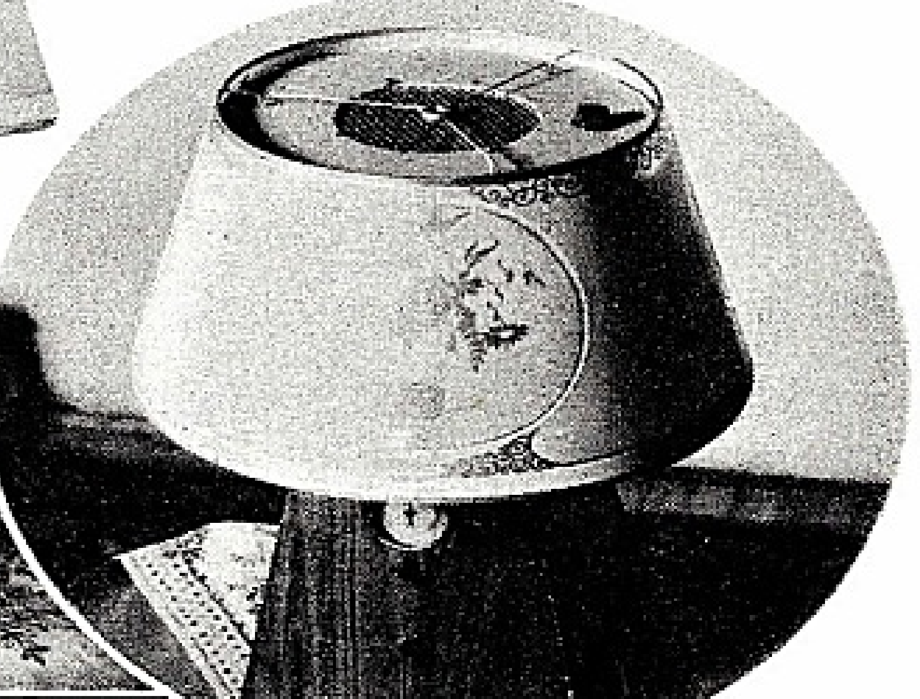
This powerful searchlight is one of several made in the Lee electrical laboratory. Reflector came from an auto headlight, carbons, from a flashlight battery, pivoting base from auto generator. Unit is mounted atop garage.

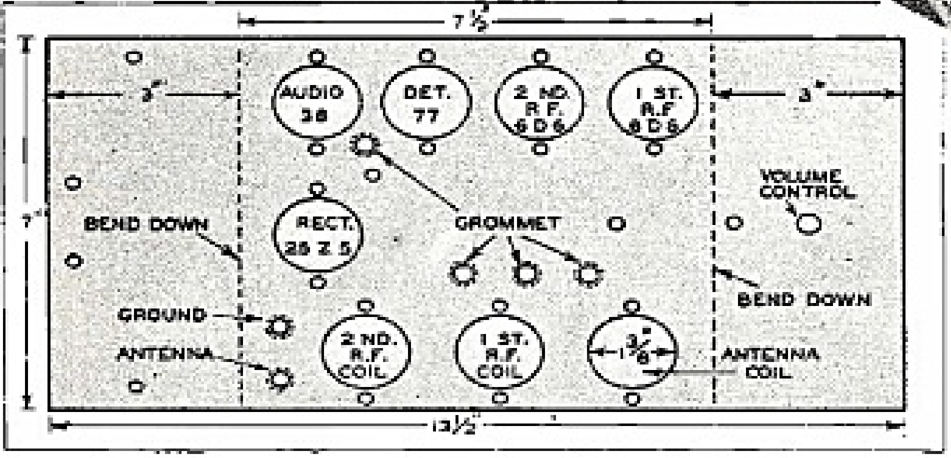


The 30-pound electric motor (circle) is powerful enough to spin a huge grindstone. The motor at the right, made three years ago from watch parts, scraps of iron, and a knitting needle, is controlled by a toy train transformer. Scrap wire was spliced together for the windings.

Five-Tube Radio







The beauty of design of this table lamp radio is clearly demonstrated by the photo at the upper left. The shade rests upon the pressed wood baffle of the six-inch magnetic speaker. Tone control may be seen in photo in circle. Speaker grille is piece of hardware cloth. Enamel bottom side of baffle white to reflect light. Volume control is lowest knob on front of set. Cabinet dimensions are: Bottom—9½" wide x 10" deep; Top—5" wide x 6" deep; Height—12½". One-half inch walnut was used here for cabinet. Cut out strip of electralloy to dimensions at left and bend to form chassis. An electralloy shelf is mounted at bottom rear to support the filter condensers and filter choke, being held in place by angle brackets.

NOVEL as well as useful is this five-tube all-electric radio receiver. Built into an attractive walnut table lamp, the speaker is concealed inside the shade. A simple but high gain tuned radio frequency circuit brings in police calls as well as local and distant broadcast band programs.

Electricity ordinarily wasted in the filament resistor of the midget radio is used here for the electric light bulb, making the cost of operation of this radio negligible.

A 25Z5 rectifier tube in a voltage doubling circuit gives nearly 200 volts of pure direct current, resulting in greater sensitivity and more power output into the speaker than is available in the ordinary midget radio. A tone control is mounted on the speaker baffle.

With good radio parts available at new low prices from mail order radio supply houses, this receiver complete should not cost more than fifteen dollars—less if you already have a few parts on hand. Although the set as pictured here can be used only on 110 volts a. c., it is possible to add a simple switch and use the set on a 110-volt d. c. line.

The cabinet may be constructed from any veneer or hardwood material from ¼" to ½" thick. Only three holes need be drilled on the front panel. Two small hooks and eyes hold the hinged door at the back of the cabinet closed. Rubber head tacks or legs should be used to raise the bottom of the cabinet about half an inch to give the necessary ventilation, and allow space for the extension cord, an-

Is Built Into TABLE LAMP

by P. M. OHLINGER

tenna lead-in, and ground wire to run under.

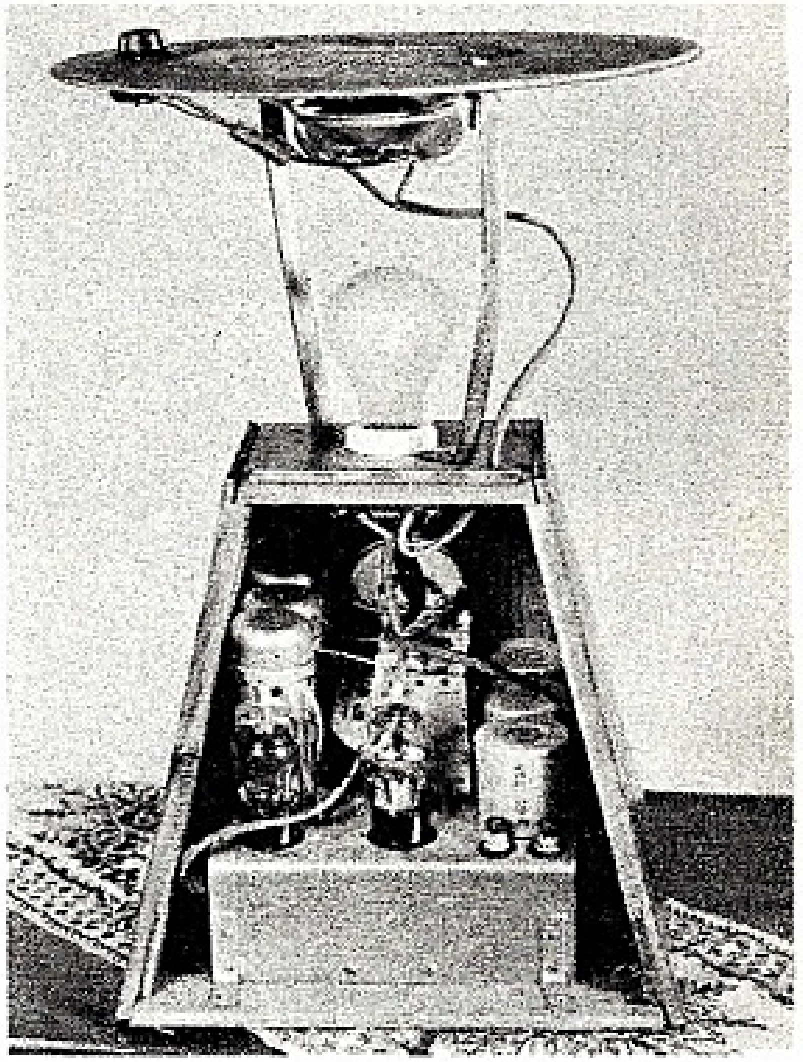
The electralloy chassis on which all parts are mounted slides out through the back of the set, once the two bolts which fasten it to the bottom board of the cabinet are removed, and the control dials on the front panel taken off. The face of the airplane dial fastens permanently to the cabinet, the dial sliding back with the chassis.

Connect all parts according to the circuit diagram, soldering every lead carefully and using rubber-covered, push-back type wire. By studying the diagram carefully and planning a bit before connecting in the smaller resistors and condensers, you will find that most of these can be mounted by their own leads, without using additional wire.

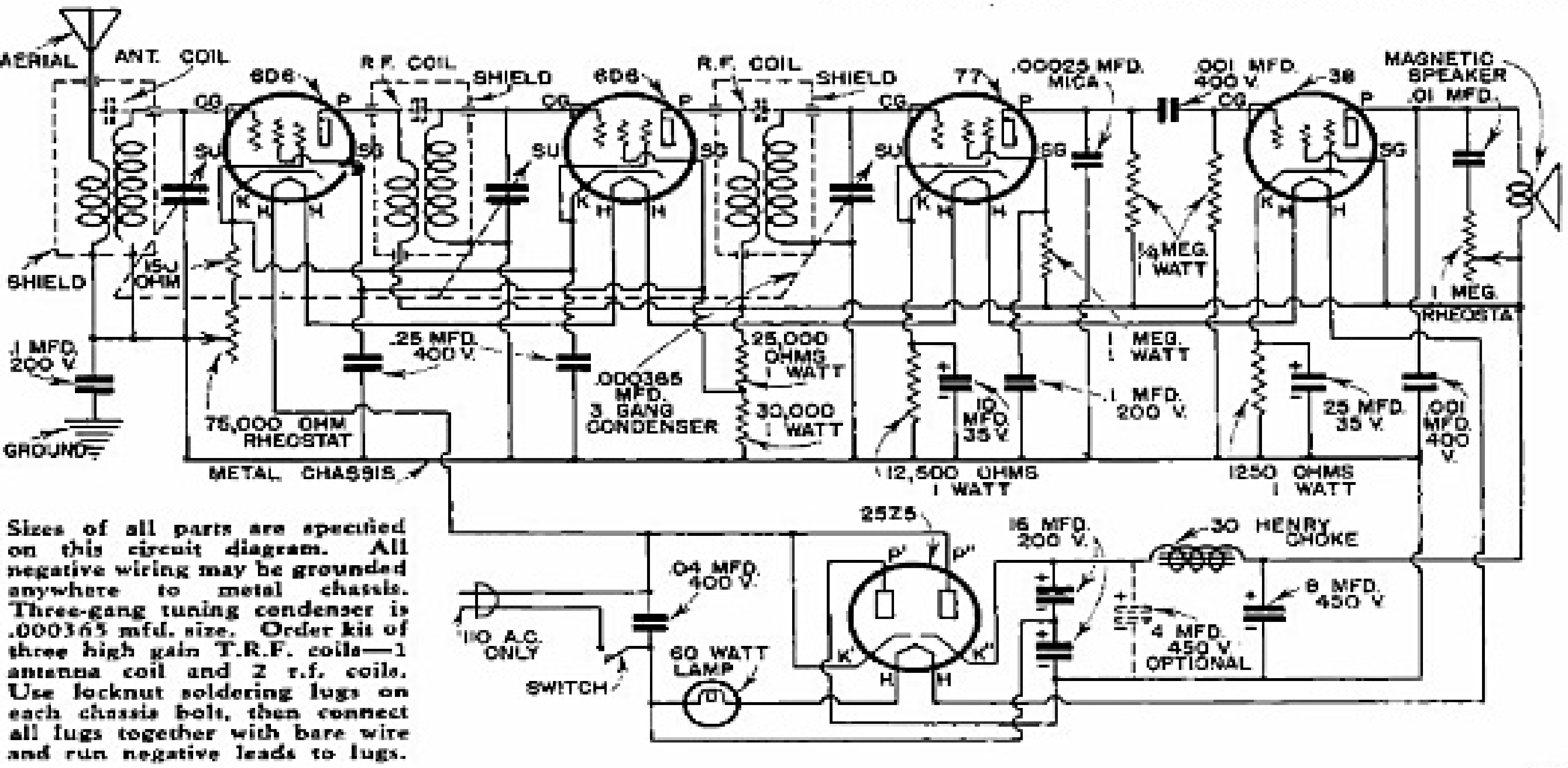
TABLE LAMP RADIO BLUEPRINTS

MM blue line prints, containing all diagrams enlarged many times, will simplify the construction of this radio set for you. Included with the plans is a complete list of parts needed. If you prefer to work from blueprints, send 50c for your plans to Modern Mechanix Pub. Co., Minneapolis, Minn.

FREE PARTS LIST—If you do not care to order the blueprints at this time, but need the parts list, send in a stamped addressed envelope with your request, and this detailed list will be sent free of charge.



Back of cabinet, hinged at top, has been removed to show chassis and speaker. Two bolts hold the chassis in place.


AERIAL
ANT. COIL
SHIELD
6D6
CG
P
SU
SG
K
H
H
R.F. COIL
SHIELD
6D6
R.F. COIL
SHIELD
77
.00025 MFD. MICA
.001 MFD. 400 V.
38
MAGNETIC SPEAKER
.01 MFD.
15J OHM
SHIELD
.1 MFD. 200 V.
GROUND
75,000 OHM RHEOSTAT
.25 MFD. 400 V.
.000365 MFD. 3 GANG CONDENSER
25,000 OHMS 1 WATT
30,000 1 WATT
¼ MEG. 1 WATT
1 MEG. 1 WATT
10 MFD. 35 V.
.1 MFD. 200 V.
12,500 OHMS 1 WATT
1250 OHMS 1 WATT
25 MFD. 35 V.
.001 MFD. 400 V.
1 MEG. RHEOSTAT
METAL CHASSIS
2525
P'
P''
K'
K''
16 MFD. 200 V.
30 HENRY CHOKE
8 MFD. 450 V.
4 MFD. 450 V. OPTIONAL
.04 MFD. 400 V.
110 A.C. ONLY
SWITCH
60 WATT LAMP

Sizes of all parts are specified on this circuit diagram. All negative wiring may be grounded anywhere to metal chassis. Three-gang tuning condenser is .000365 mfd. size. Order kit of three high gain T.R.F. coils—1 antenna coil and 2 r.f. coils. Use locknut soldering lugs on each chassis bolt, then connect all lugs together with bare wire and run negative leads to lugs.

"Tiny Tom"—

You can be dispatcher of a complete table top railroad. Here are detailed plans for building an 00 gauge locomotive and tender at a cost of $5.00.

by **EARL DUVAL**

PART I

MODEL railroading is a hobby that has an unparalleled appeal to young and old alike. It is a hobby that offers free flight of imagination to those that enjoy the clamor of freight trains in a busy metropolitan switching yard and get a thrill out of the passenger trains that speed through the night.

Model railroading packs all those thrills into your own home. You can have a complete railroad system of your own at any price from five dollars to thousands of dollars. The model railroad is not a toy. It is a serious hobby in which actual scale models only are considered.

The systems vary in scale from the tiny HO gauge so popular in England to larger live steam outdoor models. One of the handiest scales to squeeze into a limited space is the 4 millimetre to the foot scale, better known as OO gauge.

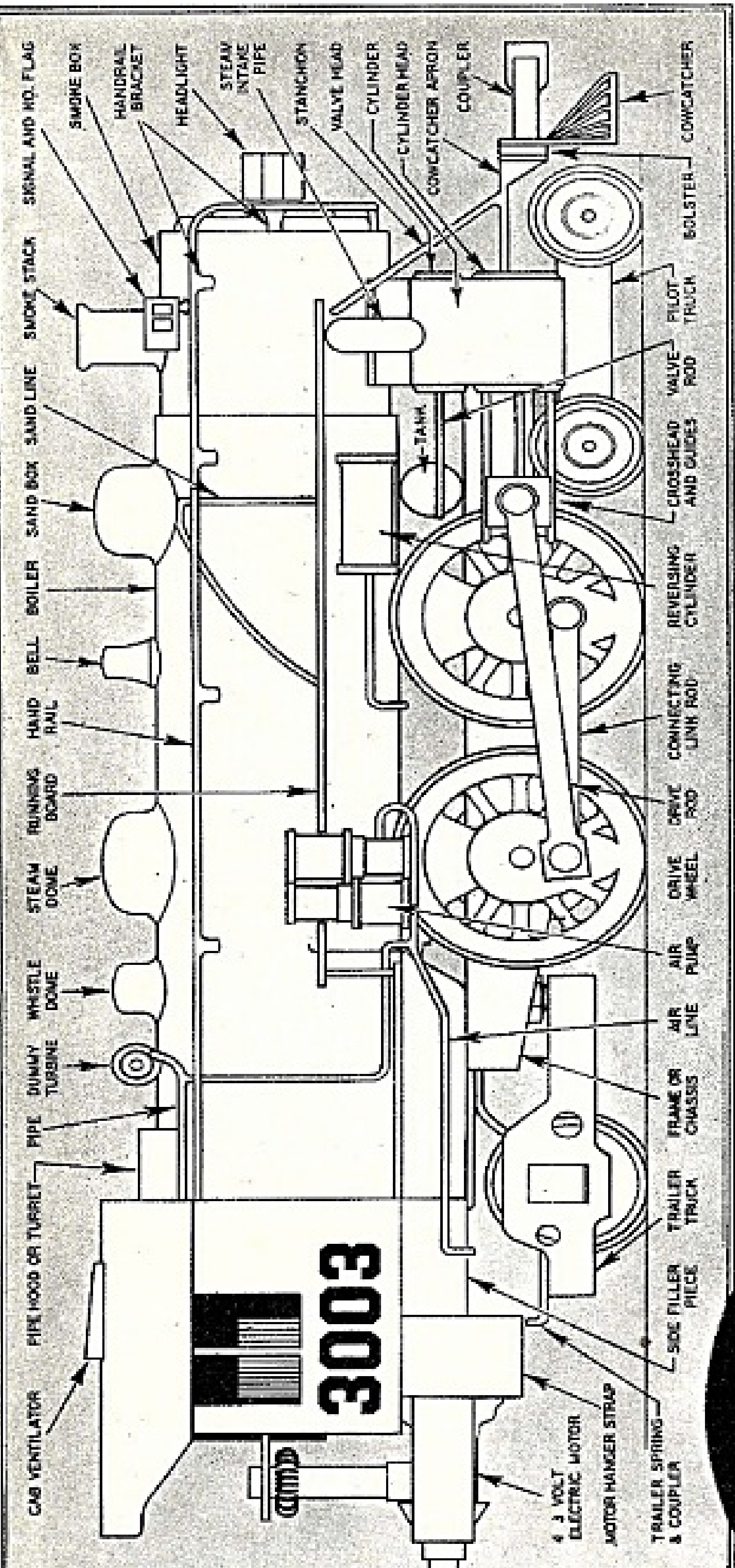
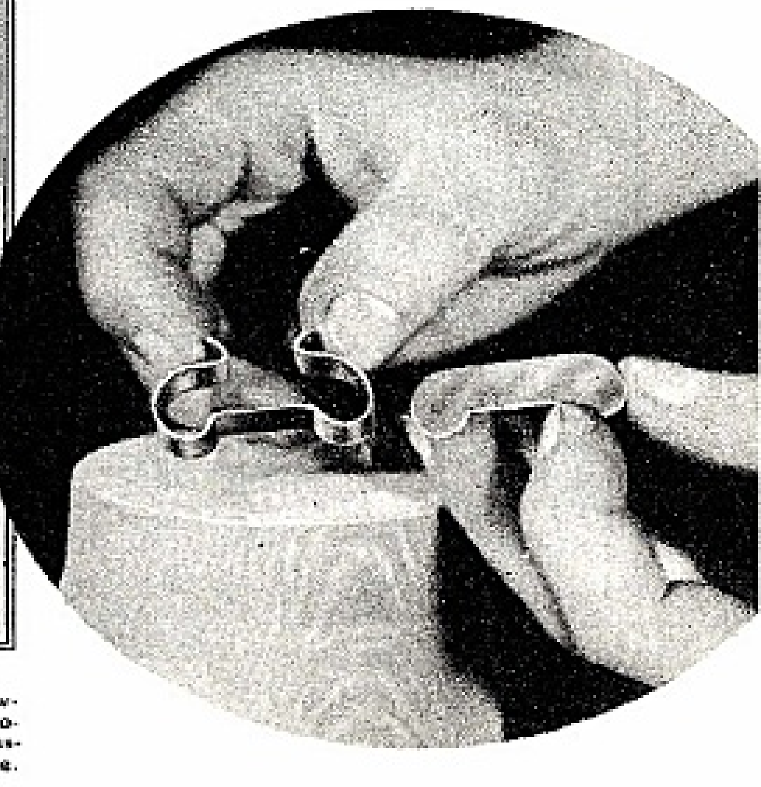
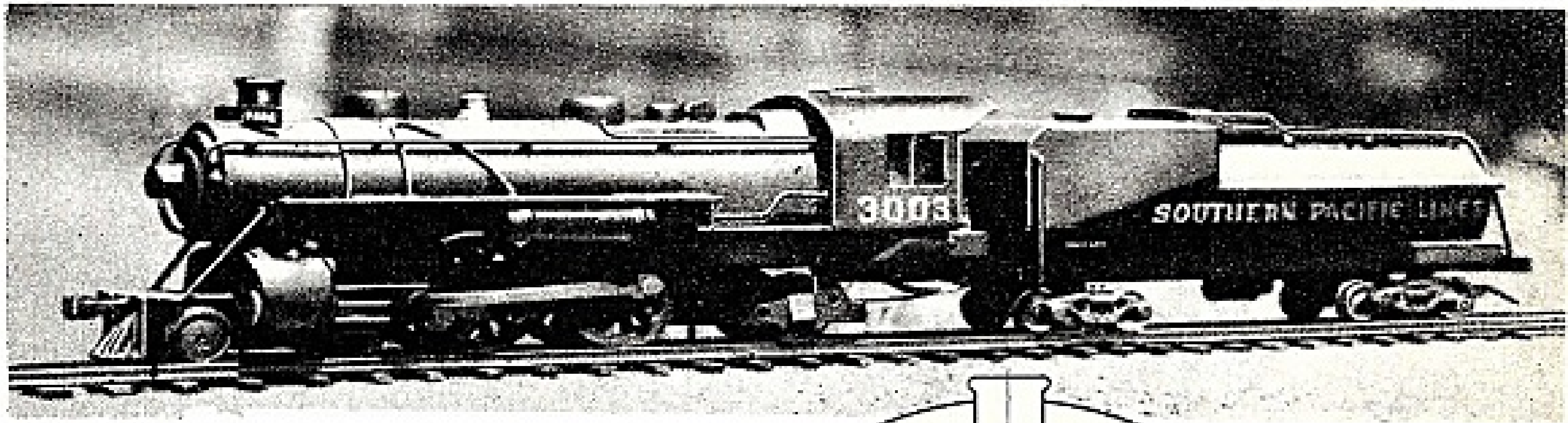

SIGNAL AND HO. FLAG
SMOKE BOX
HANDRAIL BRACKET
HEADLIGHT
STEAM INTAKE PIPE
STANCHION
VALVE HEAD
CYLINDER
CYLINDER HEAD
COWCATCHER APRON
COUPLER
COWCATCHER
BOLSTER
PILOT TRUCK
VALVE ROD
TANK
CROSSHEAD AND GUIDES
REVERSING CYLINDER
CONNECTING LINK ROD
DRIVE ROD
DRIVE WHEEL
AIR PUMP
AIR LINE
FRAME OR CHASSIS
TRAILER TRUCK
SIDE FILLER PIECE
TRAILER SPRING & COUPLER
MOTOR HANGER STRAP
4 .3 VOLT ELECTRIC MOTOR
SMOKE STACK
SAND LINE
SAND BOX
BOILER
BELL
HAND RAIL
RUNNING BOARD
STEAM DOME
WHISTLE DOME
DUMMY TURBINE
PIPE
PIPE HOOD OR TURRET
CAB VENTILATOR
3003

FIG. I ACTUAL SIZE SIDE VIEW OF THE ASSEMBLED LOCOMOTIVE "OO" GAUGE ATLANTIC TYPE 4-4-2



Get an idea of the small size of "Tiny Tom" from the actual size drawing above. Use Fig. 1 to identify and scale off parts of the locomotive mentioned in text. Right—How the cylinder saddle is assembled. Brass strap is soldered to two end pieces to form saddle.

A Pencil-Length Locomotive



3003
SOUTHERN PACIFIC LINES

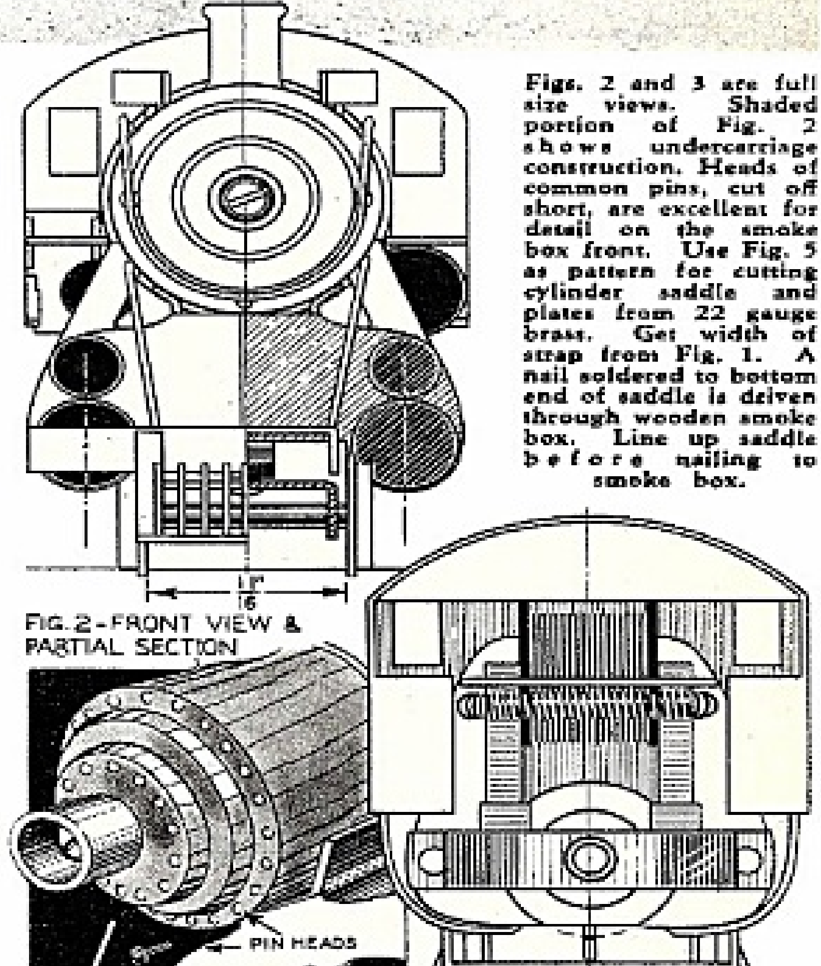
Here is "Tiny Tom," the completed 00 gauge locomotive and tender. Every essential detail of its full size Southern Pacific prototype is reproduced in this 4 mm. scale model.

An OO gauge track measures ¾" between the rails. The average OO gauge passenger locomotive is about seven inches long, about the length of a lead pencil, and 2¼ inches high. Box cars are about six inches long. With OO gauge it is possible to build an entire railroad system on top of a table, hence the term "table top railway."

"Tiny Tom," the OO gauge locomotive about to be described, can be built in a week of spare time at a cost of approximately five dollars. It is an Atlantic 4-4-2 type of passenger and fast freight locomotive used by the Southern Pacific railroad between Oakland, San Francisco, and Bakersfield.

The plans show an exact scale reduction to 4 mm. per foot with such detail of the full-sized locomotive as will look well and work well on the model. An actual idea of its size can be obtained by turning to Fig. 1 which is a full size drawing of the completed locomotive.

Begin by cutting out the,boiler according to



1 1/16"

FIG. 2 - FRONT VIEW & PARTIAL SECTION

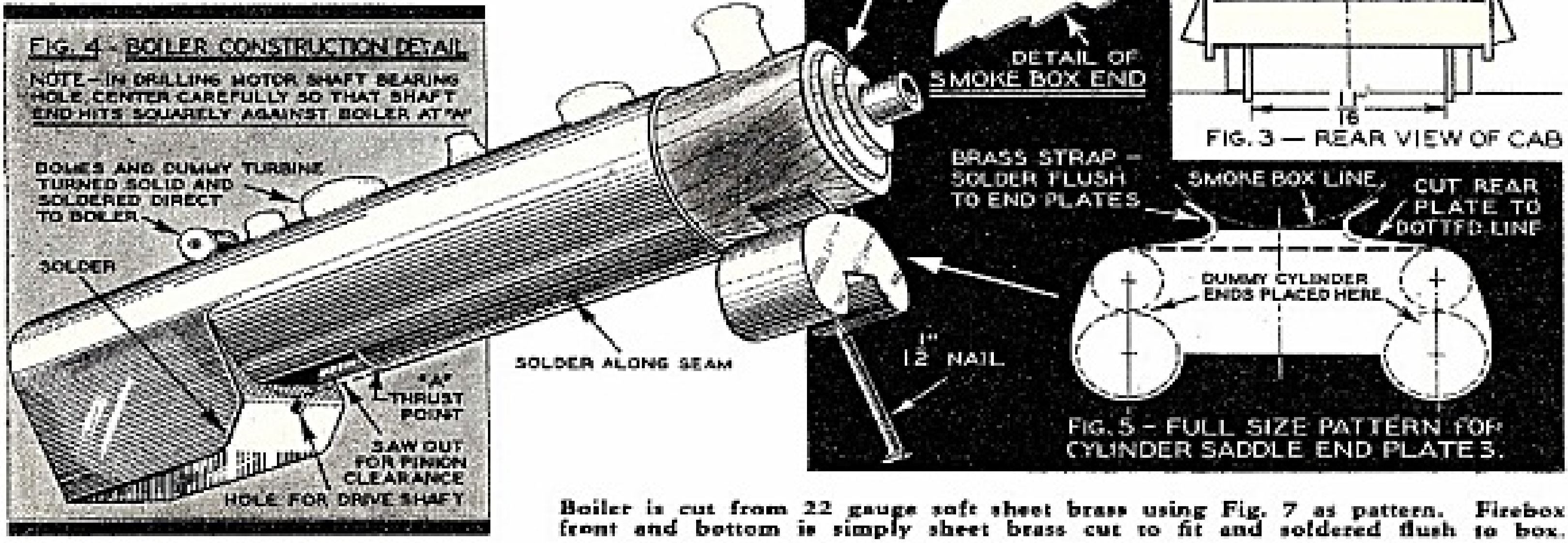
PIN HEADS
DETAIL OF SMOKE BOX END
1 1/16"

FIG. 3 — REAR VIEW OF CAB

Figs. 2 and 3 are full size views. Shaded portion of Fig. 2 shows undercarriage construction. Heads of common pins, cut off short, are excellent for detail on the smoke box front. Use Fig. 5 as pattern for cutting cylinder saddle and plates from 22 gauge brass. Get width of strap from Fig. 1. A nail soldered to bottom end of saddle is driven through wooden smoke box. Line up saddle before nailing to smoke box.

FIG. 4 - BOILER CONSTRUCTION DETAIL

NOTE—IN DRILLING MOTOR SHAFT BEARING HOLE, CENTER CAREFULLY SO THAT SHAFT END HITS SQUARELY AGAINST BOILER AT "A"



DOMES AND DUMMY TURBINE TURNED SOLID AND SOLDERED DIRECT TO BOILER
SOLDER
SOLDER ALONG SEAM
"A" THRUST POINT
SAW OUT FOR PINION CLEARANCE
HOLE FOR DRIVE SHAFT
1½" NAIL
BRASS STRAP — SOLDER FLUSH TO END PLATES
SMOKE BOX LINE
CUT REAR PLATE TO DOTTED LINE
DUMMY CYLINDER ENDS PLACED HERE

FIG. 5 - FULL SIZE PATTERN FOR CYLINDER SADDLE END PLATES.

Boiler is cut from 22 gauge soft sheet brass using Fig. 7 as pattern. Firebox front and bottom is simply sheet brass cut to fit and soldered flush to box.

Full-Size Patterns Simplify LOCOMOTIVE CONSTRUCTION

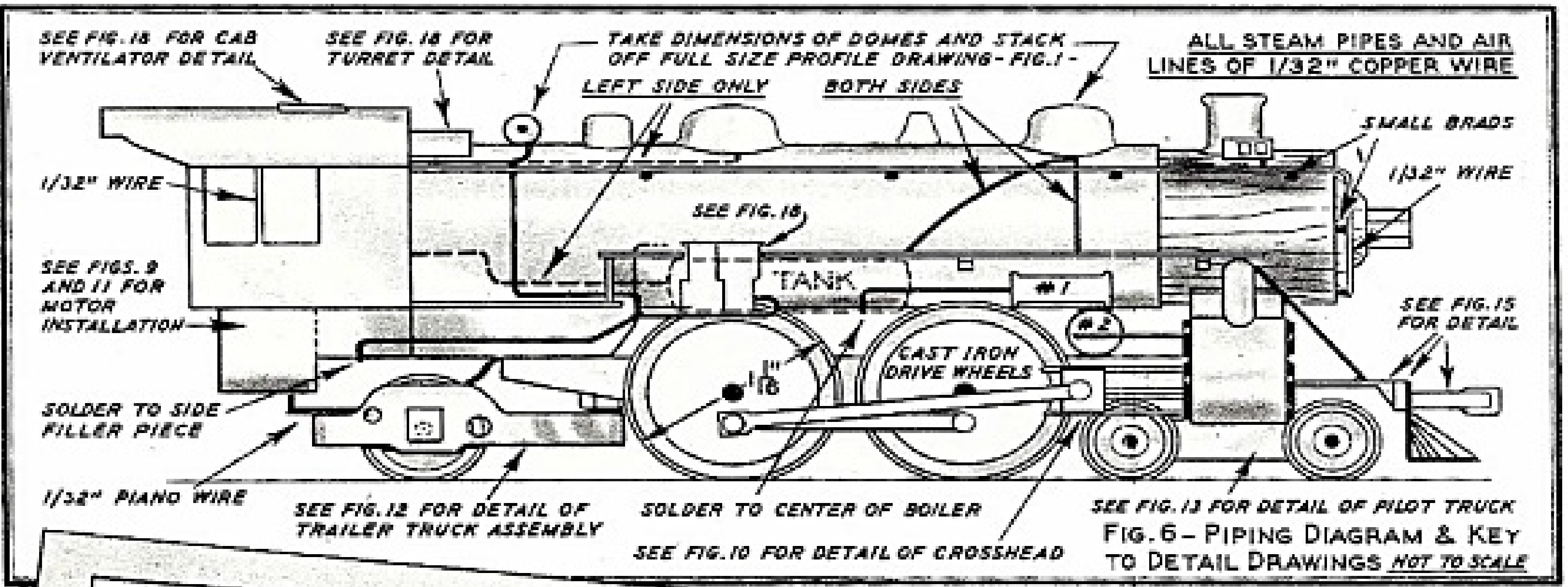

SEE FIG. 18 FOR CAB VENTILATOR DETAIL
SEE FIG. 18 FOR TURRET DETAIL
TAKE DIMENSIONS OF DOMES AND STACK OFF FULL SIZE PROFILE DRAWING - FIG. 1 -
LEFT SIDE ONLY
BOTH SIDES
ALL STEAM PIPES AND AIR LINES OF 1/32" COPPER WIRE
SMALL BRADS
1/32" WIRE
1/32" WIRE
SEE FIG. 18
TANK
#1
#2
CAST IRON DRIVE WHEELS
1 1/16"
SEE FIGS. 9 AND 11 FOR MOTOR INSTALLATION
SEE FIG. 15 FOR DETAIL
SOLDER TO SIDE FILLER PIECE
1/32" PIANO WIRE
SEE FIG. 12 FOR DETAIL OF TRAILER TRUCK ASSEMBLY
SOLDER TO CENTER OF BOILER
SEE FIG. 10 FOR DETAIL OF CROSSHEAD
SEE FIG. 13 FOR DETAIL OF PILOT TRUCK

FIG. 6 – PIPING DIAGRAM & KEY TO DETAIL DRAWINGS NOT TO SCALE

Fig. 6 will be used as key to detail drawings in this and Part II. Dotted lines show detail on opposite side of boiler.

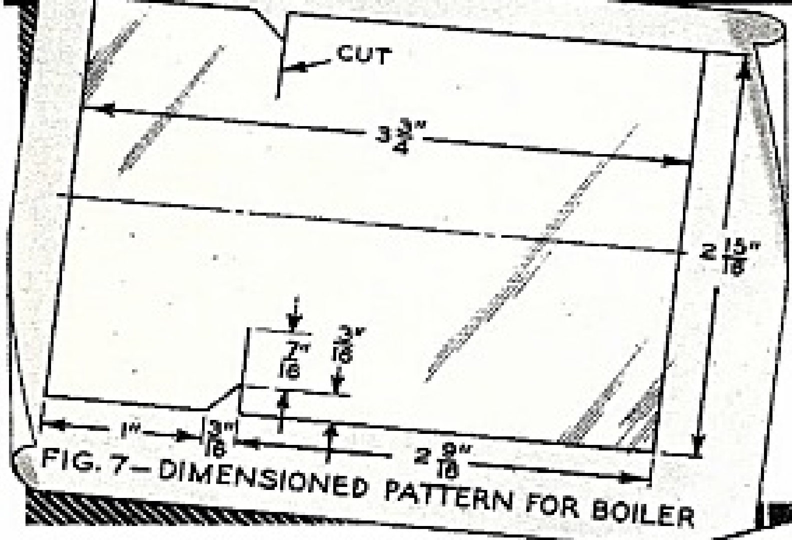

CUT
$3\frac{3}{4}$"
$2\frac{15}{16}$"
$\frac{3}{16}$"
$\frac{7}{16}$"
1"
$\frac{3}{16}$"
$2\frac{9}{16}$"

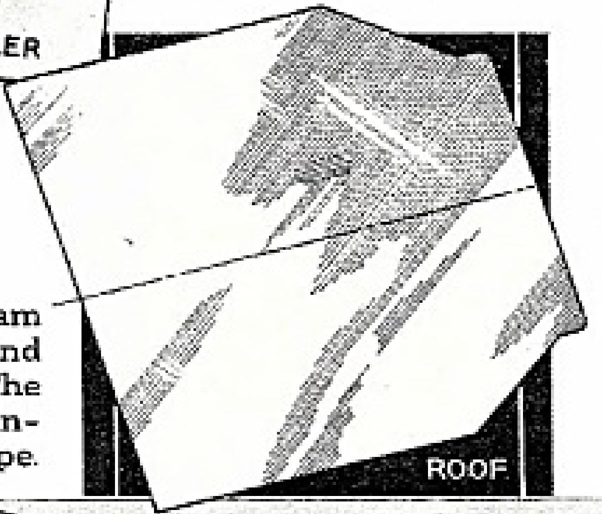
FIG. 7 – DIMENSIONED PATTERN FOR BOILER

Fig. 7. Put a short length of broom stick or shafting in a vise and bend the boiler evenly about it until the seam edges come together. Then solder.

With the edges of the boiler seam soldered, cut out the firebox front end and the bottom, soldering them on. The dummy smokebox (Fig. 4) is next inserted and fastened with airplane dope.

Next the brass turnings which represent dummy turbine, whistle, steam dome, sand dome, bell, stack, and headlight are made on the lathe. Dimensions can be obtained from the full size drawing, Fig. 1. The stack and headlight are screwed in. The others are soldered on. Any excess solder on these and other connections are filed or scraped smooth.

The cylinder saddle is just a brass strap with two end plates soldered in. Fig. 5 shows a full size template for the end pieces. The little brass turnings representing the valve and cylinder ends are soldered in place taking care to align them so they look centered and true. This must be done after the saddle is fastened on to the boiler.



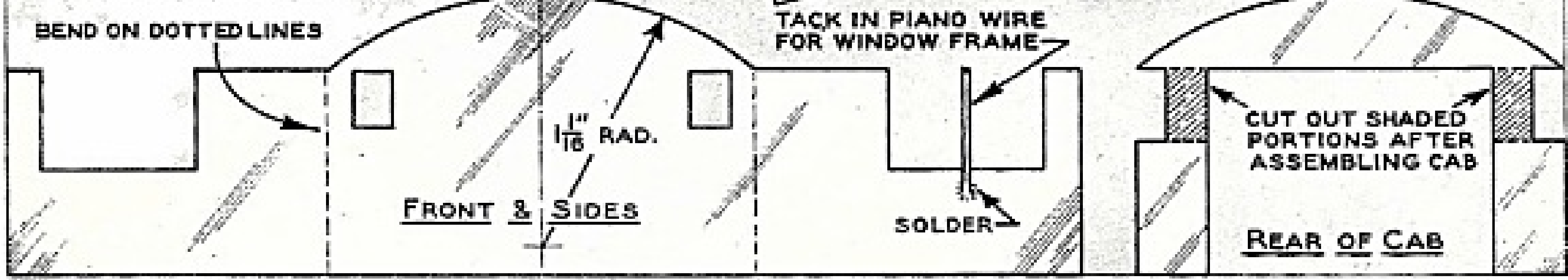

BEND ON DOTTED LINES
$1\frac{1}{16}$" RAD.
FRONT & SIDES
TACK IN PIANO WIRE FOR WINDOW FRAME
SOLDER
CUT OUT SHADED PORTIONS AFTER ASSEMBLING CAB
REAR OF CAB

FIG. 8 COMPLETE FULL-SIZE PATTERNS FOR CAB—CUT TEMPLATE TO OUTSIDE OF LINES.

Use drawings above as full size pattern for cutting cab from 22 gauge brass. Roof is soldered on last. Shaded portions in rear are cut out to make room for electric motor.

Cross-Section SHOWS DRIVE DETAIL of "TINY TOM"

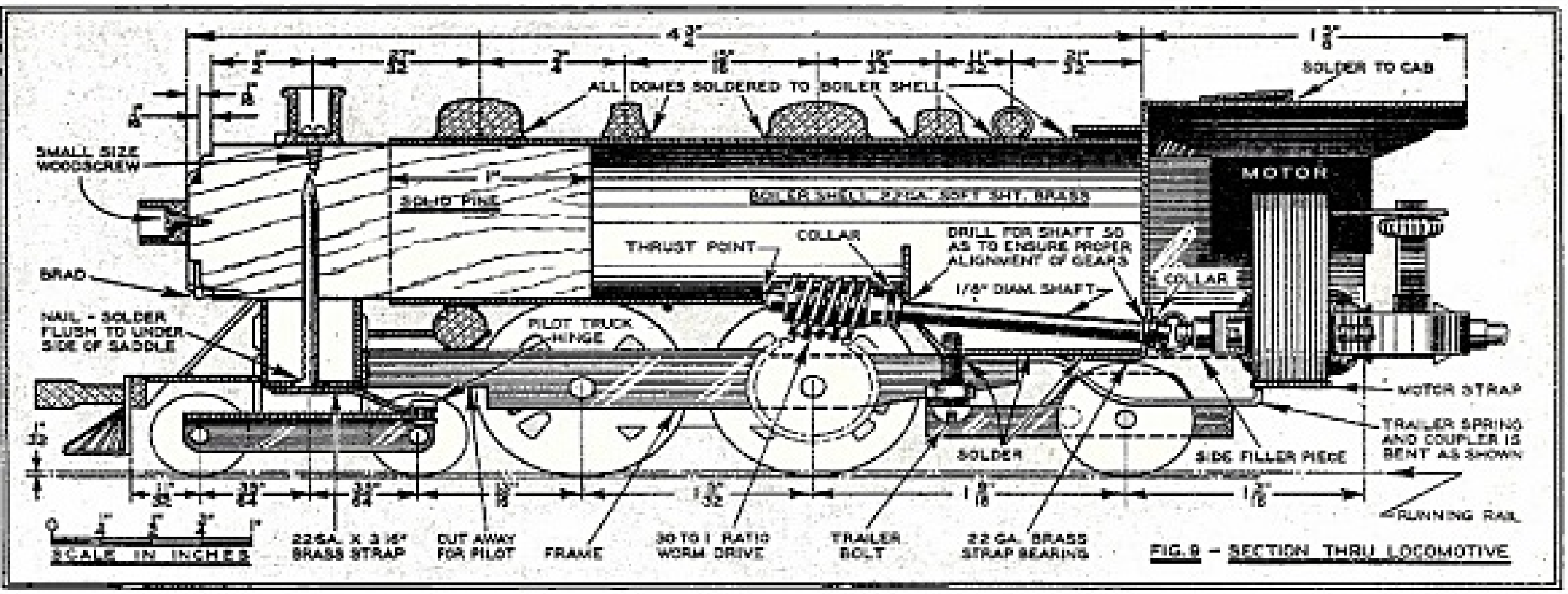

4 1/2"
1 5/8"
1/2"
27/32"
3/4"
19/32"
11/32"
21/32"
SOLDER TO CAB
ALL DOMES SOLDERED TO BOILER SHELL
SMALL SIZE WOODSCREW
1"
SOLID PINE
BOILER SHELL 22 GA. SOFT SHT. BRASS
MOTOR
THRUST POINT
COLLAR
DRILL FOR SHAFT SO AS TO ENSURE PROPER ALIGNMENT OF GEARS
1/8" DIAM. SHAFT
COLLAR
BRAD
NAIL - SOLDER FLUSH TO UNDER SIDE OF SADDLE
PILOT TRUCK HINGE
MOTOR STRAP
TRAILER SPRING AND COUPLER IS BENT AS SHOWN
SOLDER
SIDE FILLER PIECE
RUNNING RAIL
1 7/32"
1 9/16"
1 7/16"
0
1/4"
1/2"
3/4"
1"
SCALE IN INCHES
22 GA. X 3/16" BRASS STRAP
CUT AWAY FOR PILOT
FRAME
30 TO 1 RATIO WORM DRIVE
TRAILER BOLT
22 GA. BRASS STRAP BEARING

FIG. 9 – SECTION THRU LOCOMOTIVE

Above is a cross section of "Tiny Tom" drawn to accurate scale and partly dimensioned to cover important points. Gear and drive shaft assembly are shown clearly. Motor installation, trucks, and pilot construction will be covered in Part II.

The cab must be cut out according to templates in Fig. 8 and soldered to the boiler. Do not cut out the shaded portions on the rear until cab is in place and squared up.

The frame or chassis, Fig. 10, is a 22 gauge brass strap bent and soldered in place. Bend and square up the frame to shape and before soldering drill the holes for the driver axles on a drill press using a block of hardwood between the sides to prevent bending and to get the axle holes true. The cutting of the angle at the rear of the frame and the front cutaway for the pilot wheels must be done after the frame is soldered in.

The worm gear that drives the locomotive must be prepared to fit the axle of the drivers. The worm is a 30 to 1 ratio and is a standard product. The driving pinion is 5/16" diameter and has a hole for a ⅛" shaft. This is fine, and will go right on the motor drive shaft. But the driven worm, of brass, ⅝" diameter, has a boss and a 3/16" hole. The boss must be cut off, and a bushing inserted to reduce the size of the shaft hole to the ⅛" size of the brass rod used for axles.

A hole is cut in the slant face of the firebox, centered so the shaft center hits the belly of the boiler as shown in Fig. 9. A hole is also cut into the boiler to give clearance to the gear and a thrust point for the shaft. A strap bearing is soldered at the rear of the cab with

[*Continued on page 126*]

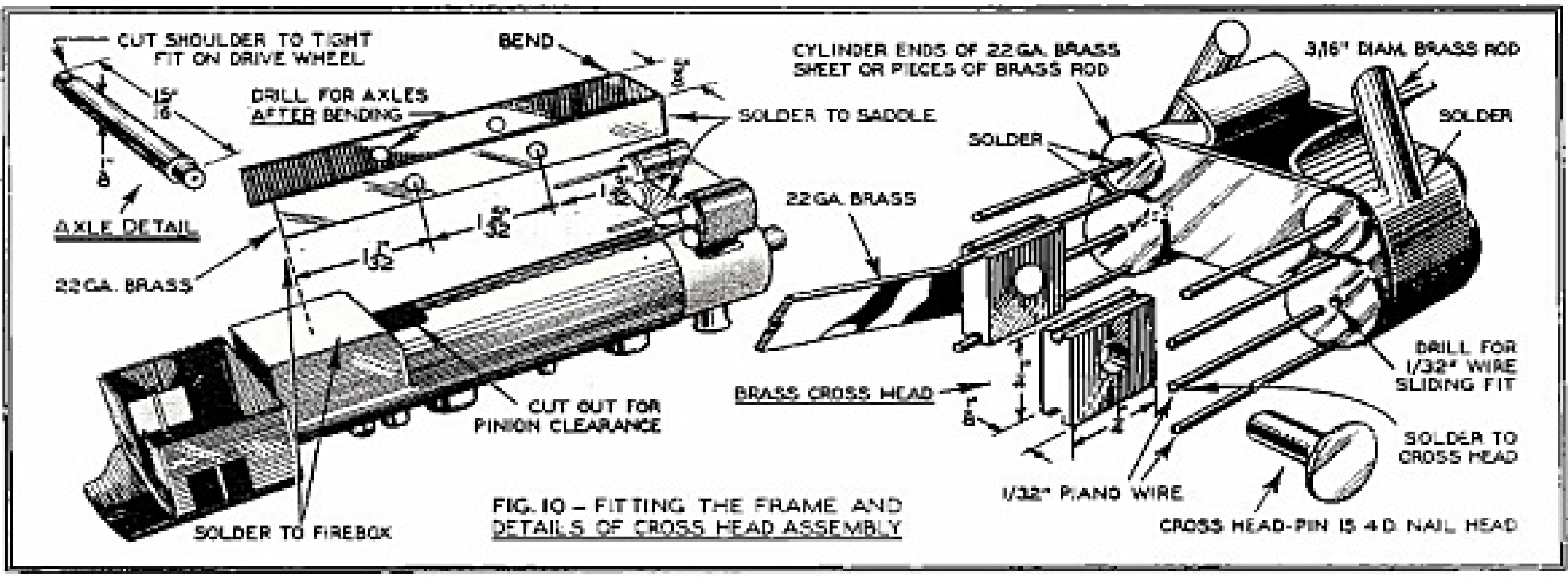
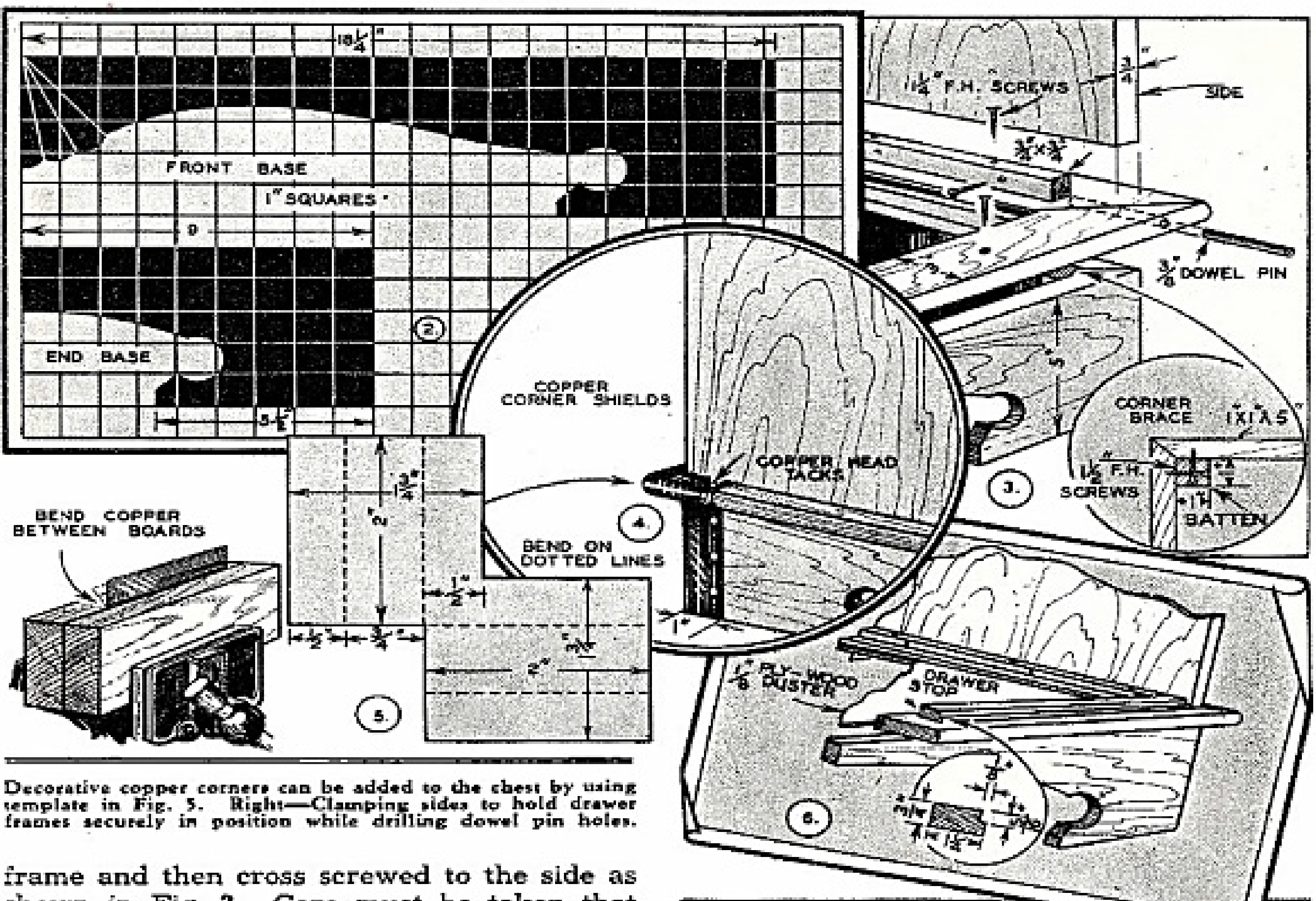

CUT SHOULDER TO TIGHT FIT ON DRIVE WHEEL
15/16"
1/8"
AXLE DETAIL
BEND
DRILL FOR AXLES AFTER BENDING
SOLDER TO SADDLE
1 5/32"
1 7/32"
22GA. BRASS
CUT OUT FOR PINION CLEARANCE
SOLDER TO FIREBOX
CYLINDER ENDS OF 22 GA. BRASS SHEET OR PIECES OF BRASS ROD
3/16" DIAM. BRASS ROD
SOLDER
SOLDER
22 GA. BRASS
BRASS CROSS HEAD
1/4"
1/8"
DRILL FOR 1/32" WIRE SLIDING FIT
SOLDER TO CROSS HEAD
1/32" PIANO WIRE
CROSS HEAD-PIN IS 4 D NAIL HEAD

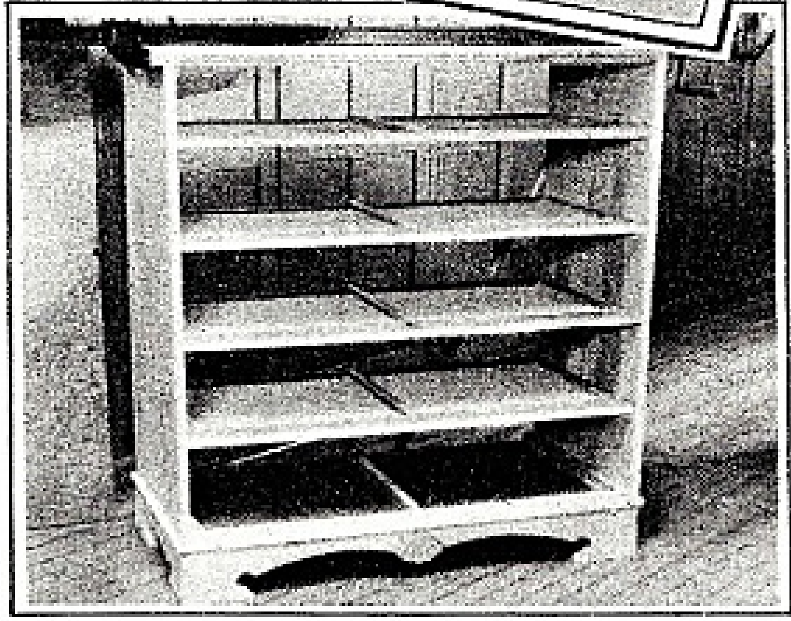
FIG. 10 – FITTING THE FRAME AND DETAILS OF CROSS HEAD ASSEMBLY

Frame is shown ready to be soldered into position. Do not drill axle holes until frame is bent to correct shape. Get depth of frame strap from Fig. 9 at top of page. Piano wire cross head guides are soldered to cylinder heads as shown above.

COPPER CORNERS Decorate Base of COLONIAL CHEST


18 1/4"
FRONT BASE
1" SQUARES
9
END BASE
5 1/2"
②
1 1/4" F.H. SCREWS
3/4"
SIDE
3/4"×3/4"
3/8" DOWEL PIN
5
CORNER BRACE
1X1 A.S
1 1/2" F.H. SCREWS
1 1/4"
BATTEN
3.
COPPER CORNER SHIELDS
COPPER HEAD TACKS
1"
4.
BEND COPPER BETWEEN BOARDS
3/4"
1 3/4"
2"
BEND ON DOTTED LINES
1/2"
1/2"
3/4"
2"
5.
1/8" PLY-WOOD DUSTER
DRAWER STOP
1 1/2"
6.

Decorative copper corners can be added to the chest by using template in Fig. 5. Right—Clamping sides to hold drawer frames securely in position while drilling dowel pin holes.



frame and then cross screwed to the side as shown in Fig. 3. Care must be taken that this strip is set far enough back to allow for the front drawer stop strip as shown in Fig. 6. This holding strip also serves as a drawer slide and should be flush with the drawer stop. The top assembly is carried out in the same manner, as shown in Fig. 8. The sides should be 35 in. apart, inside dimension, and square with base. Erect temporary cross bracing in back to hold assembly in position.

The four drawer frames of 3/4 in. stock are made next, (Fig. 10.) For absolute dust-proof protection each frame encloses a 1/4 in. plywood panel which fits in rabbeted channel.

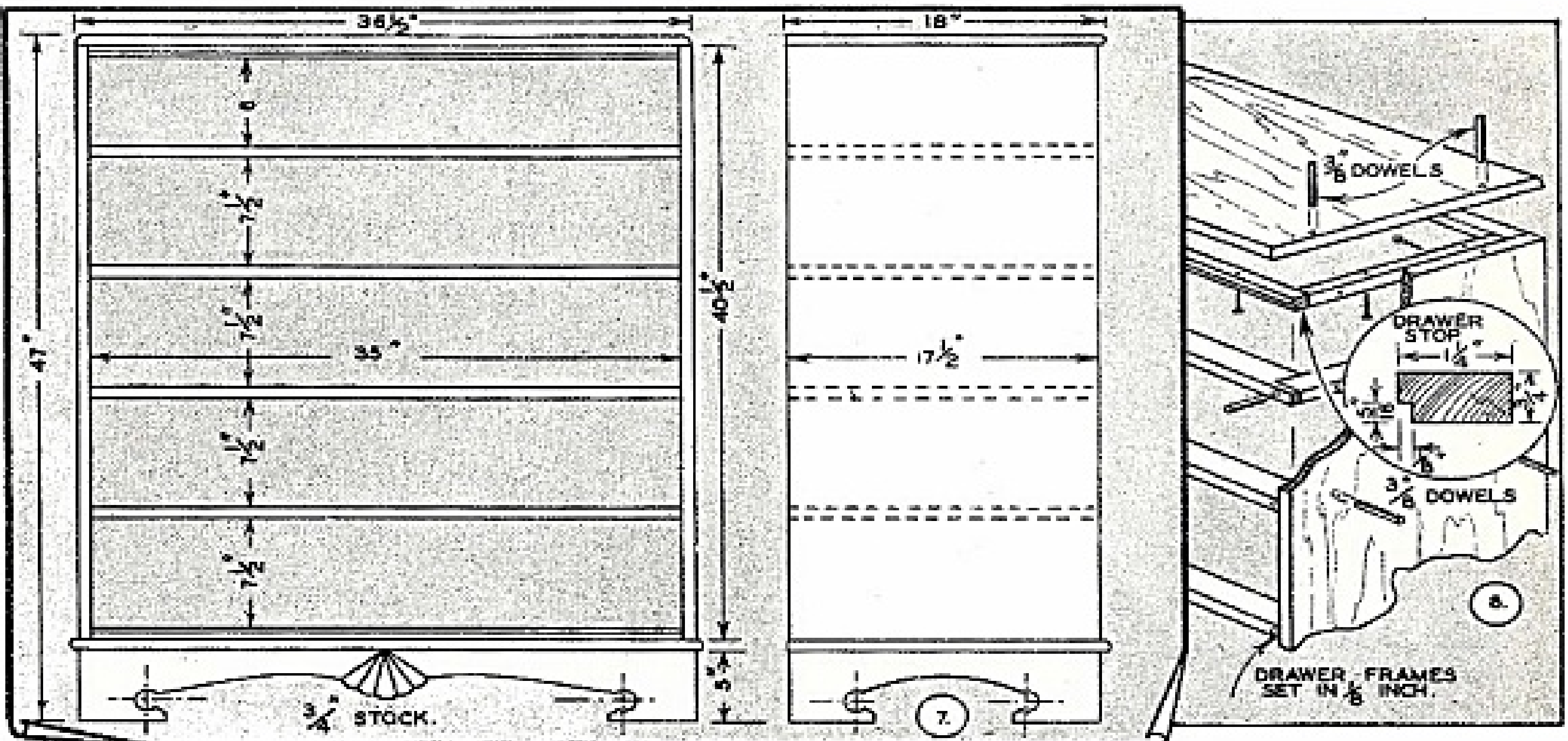
Mark out to exact dimensions the drawer spacings as shown in Fig. 7. Then fit in one frame at a time and draw up sides with two bar clamps to hold frame securely in position. Be sure that the frames are set in 1/8 in. from the front edge and 3/8 in. from the back edge to allow room for drawer moulding edge and back paneling to fit in.

With the frame held thus in position, bore two 3/8 in. dowel pin holes in each side to a depth of two inches. Slide in temporary

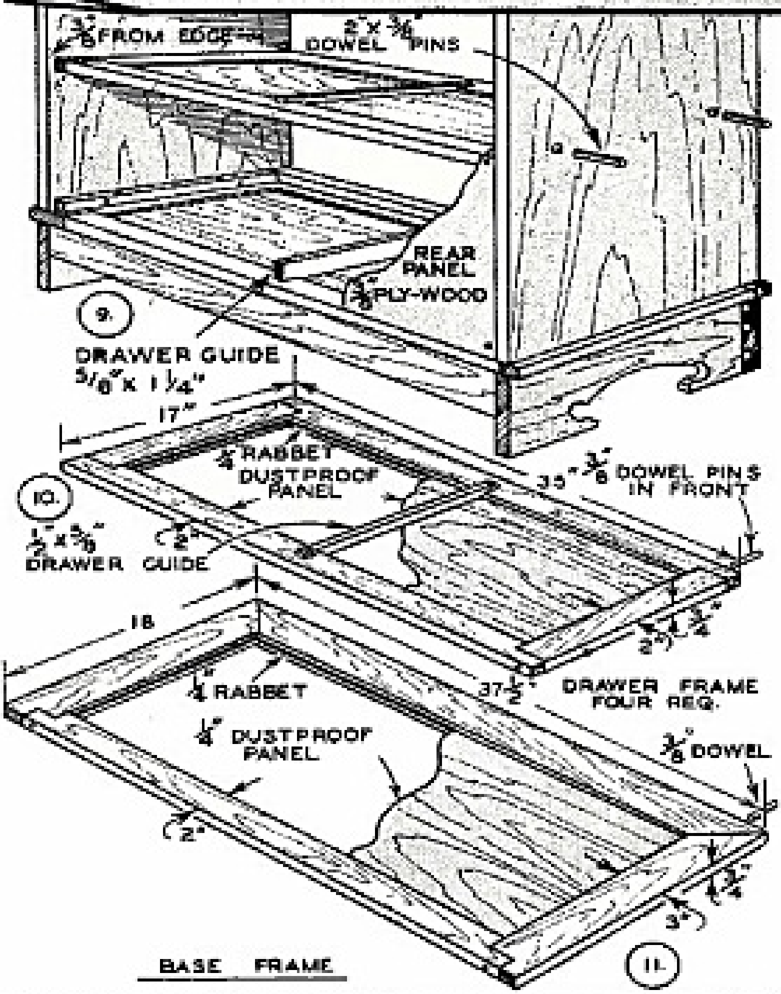
COLONIAL FURNITURE BLUEPRINTS

Colonial furniture blueprints can be obtained at twenty-five cents each for the following: Four-poster bed, bedside combination table and lamp, ladder-back chair, chest of drawers, bridge lamp, and coffee table. Send order to MODERN MECHANIX PUBLISHING COMPANY, Minneapolis, Minn.

DUSTPROOF PANELS FEATURE DRAWER FRAMES


36½"
18"
6"
7½"
7½"
7½"
7½"
40½"
47"
35"
17½"
5"
¾" STOCK.
7.
⅜" DOWELS
DRAWER STOP
1¼"
⅜" DOWELS
8.
DRAWER FRAMES SET IN ⅛ INCH.

Plans for completing frame of chest are shown here. Drawer stops (Figs. 6 and 8) are placed at forward edge of frames. The top is dowel pinned to the sides.


⅜" FROM EDGE
2" x ⅜" DOWEL PINS
REAR PANEL
⅛" PLY-WOOD
9.
DRAWER GUIDE 5/8" x 1¼"
17"
¼" RABBET
DUSTPROOF PANEL
35"
⅜" DOWEL PINS IN FRONT
10.
½" x ⅝" DRAWER GUIDE
2"
¾"
2"
DRAWER FRAME FOUR REQ.
18
37½"
¼" RABBET
¼" DUSTPROOF PANEL
⅜" DOWEL
2"
¾"
3"
BASE FRAME
11.

pins to hold frame in position and proceed in like manner with each of the other frames in turn. Then, glue and drive in all dowel pins.

Round front and end edges with a plane and sand smooth. Dowel pin top to the sides.

Each drawer face should be cut ½ in. greater in width than the space for which it is intended. Approximately 1/16 in. allowance should be made at top of rabbet and across ends to compensate for wood swelling. Outer trim-cut can be made on drill press using a cutter bit in chuck. The two rabbeted joints in Fig. 1 are good substitutes for the dovetail union. Drawer backs and ends are solid ½ in. stock while bottom is of ¼ in. plywood. Drawer bottoms fit in rabbeted channel in back, front and ends. Notch lower edge of back to fit over drawer guide.

If the chest is made of hard maple or birch, the surface is stained with golden-oak stain which is quickly rubbed off leaving a mellow brown tone. Follow with two coats of rubbed wax. Do not finish red cedar veneered surfaces. If construction is of walnut, finish by first applying liberal coat of raw linseed oil, let stand one hour and wipe dry with clean cloth. Then sand the surface lightly and apply a coat of filler, wiping off any excess. When dry rub to smooth finish with very fine sandpaper over felt pad and apply coat of white shellac. Rub this down with fine steel wool and apply furniture wax.

The copper corner shields add to the appearance and also protect the base corners. Pattern specifications are found in Fig. 5.

MEDIUMISTIC

Spirit world messages magically form on paper placed in ordinary mason jar. Make turban from black silk cloth. Wear pajama trousers, a knee-length smock put on backward, pulled tightly around the body and pinned, a bright sash tied around the waist, and complete costume with a dark smock.

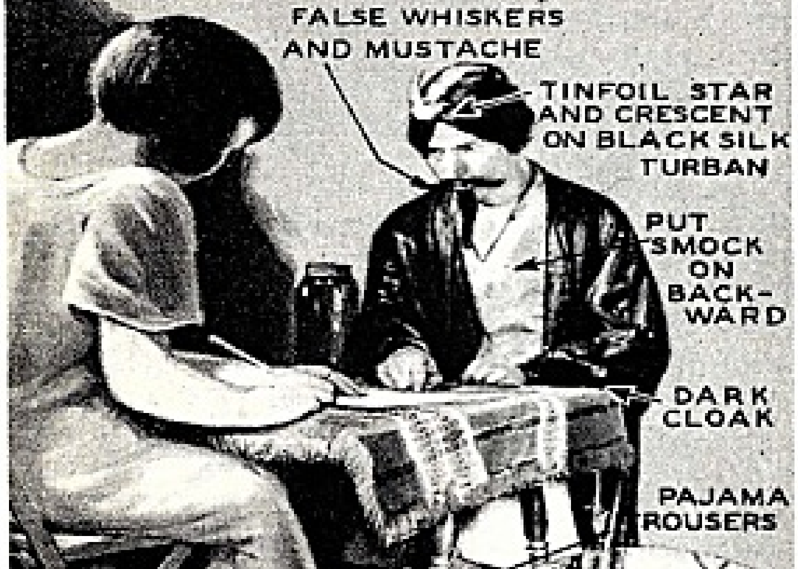
by HAROLD L. ZIMMER

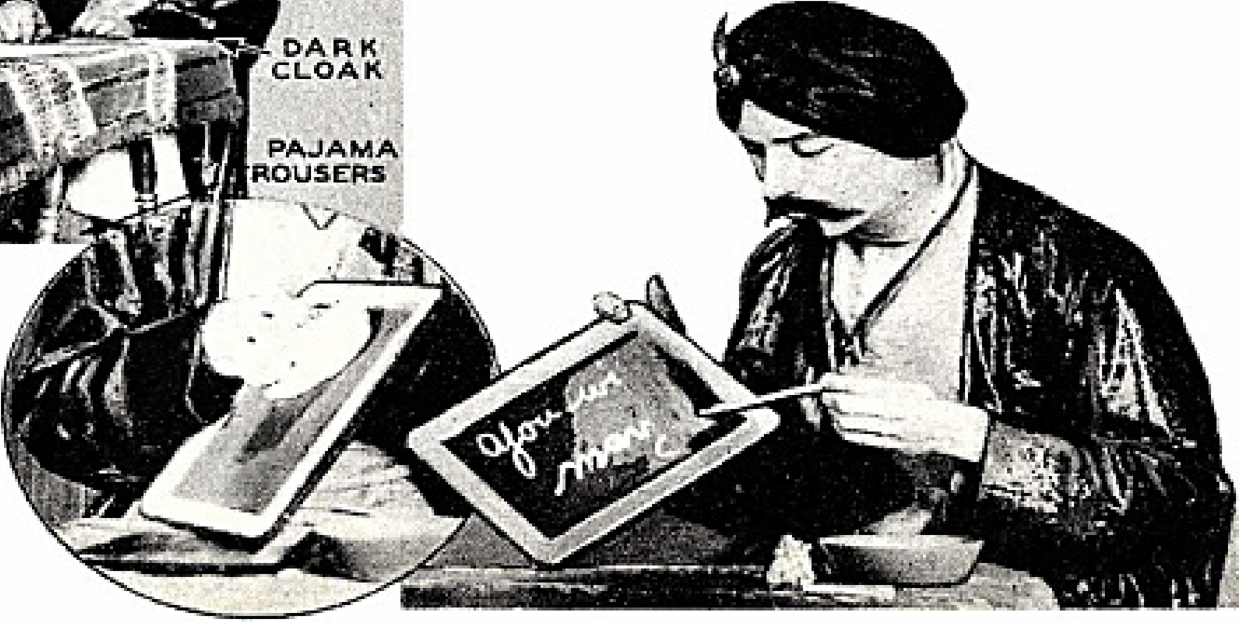
FOR new Hallowe'en thrills, put on a mediumistic party with turban-bedecked medium, darkened room, spirit writing, tables floating in the air, and all the other tricks which fake spirit mediums use so successfully. The mere suggestion, on your invitations, that all weak-hearted persons should stay at home will insure a crowd.

Drape a small room in the approved manner, placing a table and two chairs in the center, then assemble your own spirit-medium clothes. Messages from the spirit world enter this room *via* a simple but deceiving chemical trick. Call for one guest at a time, seating him opposite you at the table, then request that he write his name on the lower half of a sheet of paper. Roll up this paper, insert in an empty mason jar at your elbow, then intone:

"In a moment we shall have a message for you from the spirit world."

You pick up the jar shortly, and examine the paper through the glass. Mysterious writing is gradually forming. You remove the paper and hand it to your guest. "You will be wealthy," says the message. "Obey the medium in all things and you will never


FALSE WHISKERS AND MUSTACHE
TINFOIL STAR AND CRESCENT ON BLACK SILK TURBAN
PUT SMOCK ON BACKWARD
DARK CLOAK
PAJAMA TROUSERS



The fact that scratches on slate are invisible when wet provides spirit writing for your party. Notch or mark side of slate on which message has previously been scratched with a glass. In a small gathering, use separate slates with different messages for each person. Place the slate aside as soon as the subject reads the writing, for closer examination may reveal the secret.

TRICKS for Your Hallowe'en PARTY

Subject (above) writes question on slate, and the medium obtains the answer "out of the air." Left—The table-lifting stunt.

The "joining hands" trick is exposed at right. Stroke both hands of subject first with two hands, then with one, in absolute darkness. Gradually stop rubbing, allowing fingers to rest on subject's hands. One hand is now free to ring bells.

go wrong." The message may be anything.

The secret: Get a bottle of slightly diluted copper sulphate at the drug store; also a bottle of ammonia and a pad of white paper. Using the copper sulphate for ink, write twenty or more messages on separate pieces of paper. As the liquid dries, it vanishes. The jar is filled with ammonia, allowed to stand a few moments, then emptied. What ammonia still remains in the form of fumes is sufficient to turn the writing dark, when the copper sulphate is exposed to it.

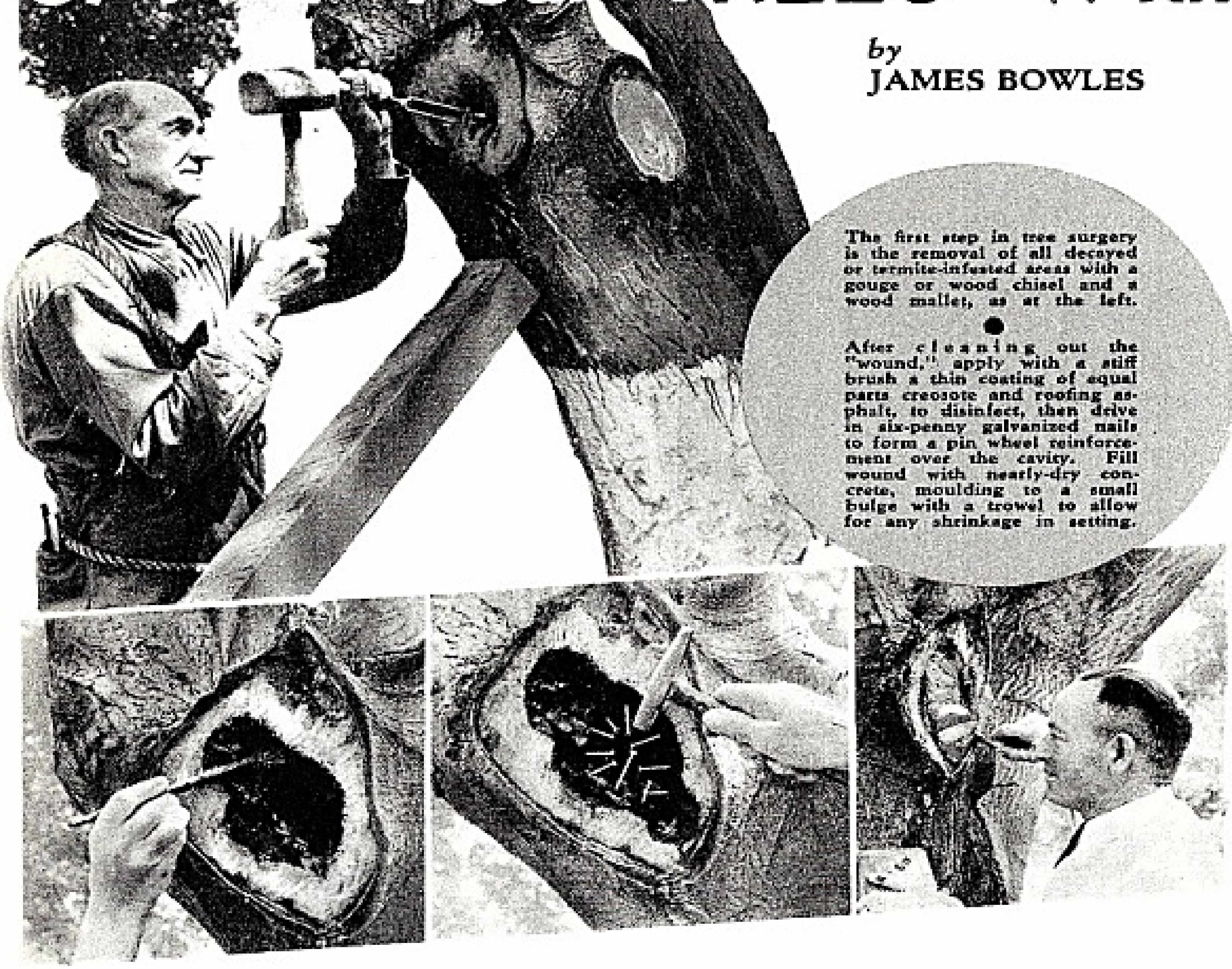
Another simple message trick, which is widely used, is the heat treatment. Use a glass-topped table for this, and have a sheet of tin or aluminum underneath, to keep it from being cracked. Fasten an electric iron to the under side, and adjust it to its lowest heating point. Run the wires down the table leg and under the rug. With cardboard or plywood, build a false bottom under the table to keep the iron from being seen. An assistant can turn the iron on a few minutes before it is needed or you can place a switch under the rug.

Write with *dilute* sulphuric acid this time. The guest writes his name, tears off the sheet

[*Continued on page* 128]

SAVE Your TREES With

by
JAMES BOWLES



The first step in tree surgery is the removal of all decayed or termite-infested areas with a gouge or wood chisel and a wood mallet, as at the left.

●

After cleaning out the "wound," apply with a stiff brush a thin coating of equal parts creosote and roofing asphalt, to disinfect, then drive in six-penny galvanized nails to form a pin wheel reinforcement over the cavity. Fill wound with nearly-dry concrete, moulding to a small bulge with a trowel to allow for any shrinkage in setting.

LIKE athletes, those trees grow to largest sizes and yield record returns in beauty and fruits which are properly nourished, protected and permitted to exercise. Although their heads bow under the scourge of disease and accident, trees possess remarkable recuperative powers and will grow vigorously following radical surgical operations which rid them of pests and decay.

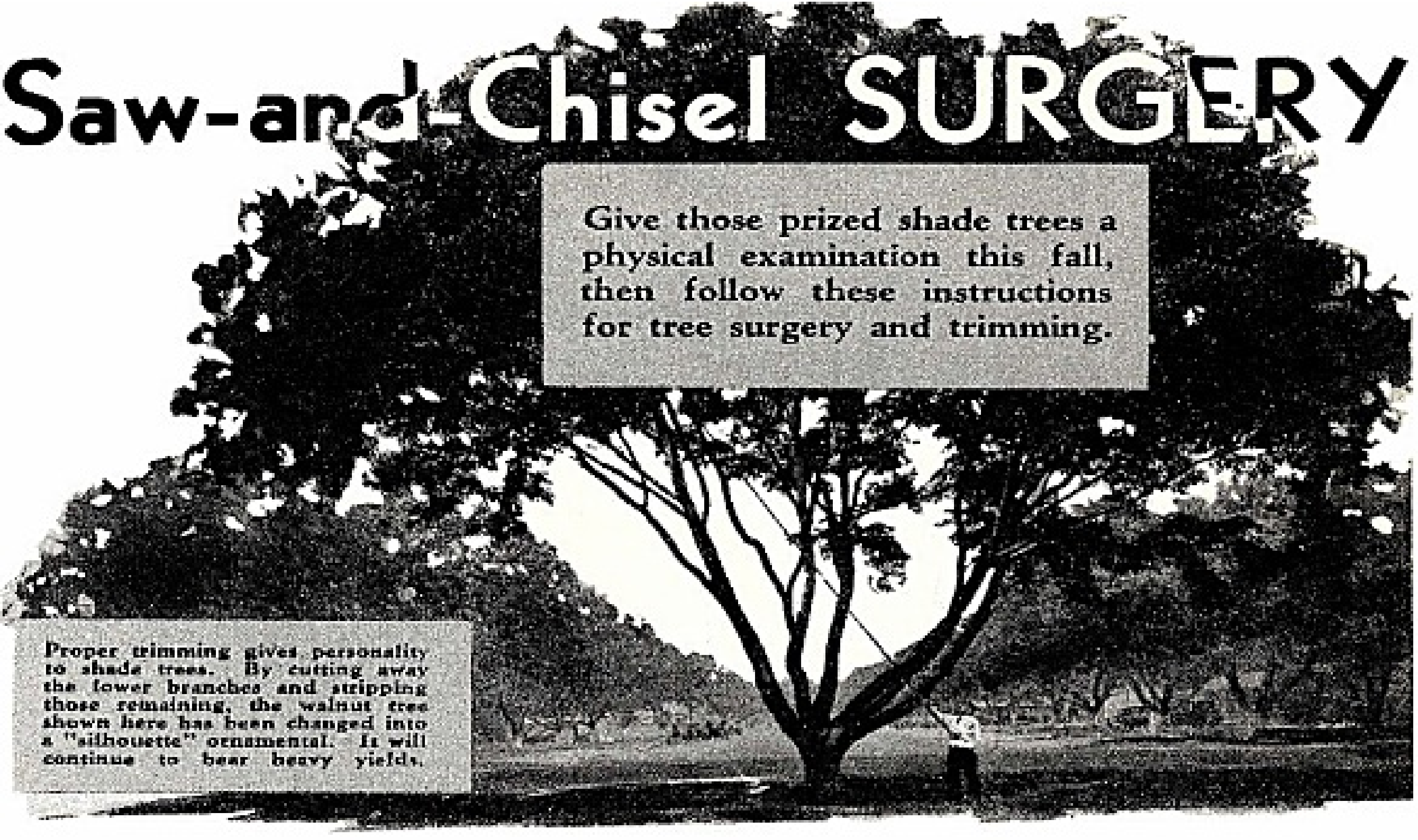
No wizardry is involved in growing healthy trees. Whether you have one or a thousand, the same rules apply. You require no tools other than the few simple ones to be found in almost any kit. In only rare cases need you call on expert aid to restore an ailing tree, no matter whether it is an ornamental on a city lot, or a fruit tree among an orchard of hundreds.

Many species will spread as wide as they are tall. When planting, therefore, space the saplings in parallel rows. Peaches and apples, for instance, should be spaced 20 feet apart in one direction, 22 the other. The extra width will leave ample room in one direction to drive a wagon or tractor during the picking season. By this method you can have 18 trees on a lot measuring 60x132 feet. Walnuts and oaks are, of course, exceptions, for these grow to prodigious sizes as compared with most trees.

Do not crowd the roots when planting. Dig the hole just deep enough so the young tree will rise from the level to which it was accustomed before transplanting, and wide

Saw-and-Chisel SURGERY

Give those prized shade trees a physical examination this fall, then follow these instructions for tree surgery and trimming.



Proper trimming gives personality to shade trees. By cutting away the lower branches and stripping those remaining, the walnut tree shown here has been changed into a "silhouette" ornamental. It will continue to bear heavy yields.

enough at the bottom so the roots can spread naturally. Fill the hole about three-fourths full with top soil, then pour in 10 to 15 gallons of water. Do not tamp the earth down. Use no fertilizer around the roots. Trim the branches, leaving stubs about four inches long.

You may start developing the tree into any shape you want it to take during the second winter after planting. Cut out all but three or four equally-spaced and sturdy branches.

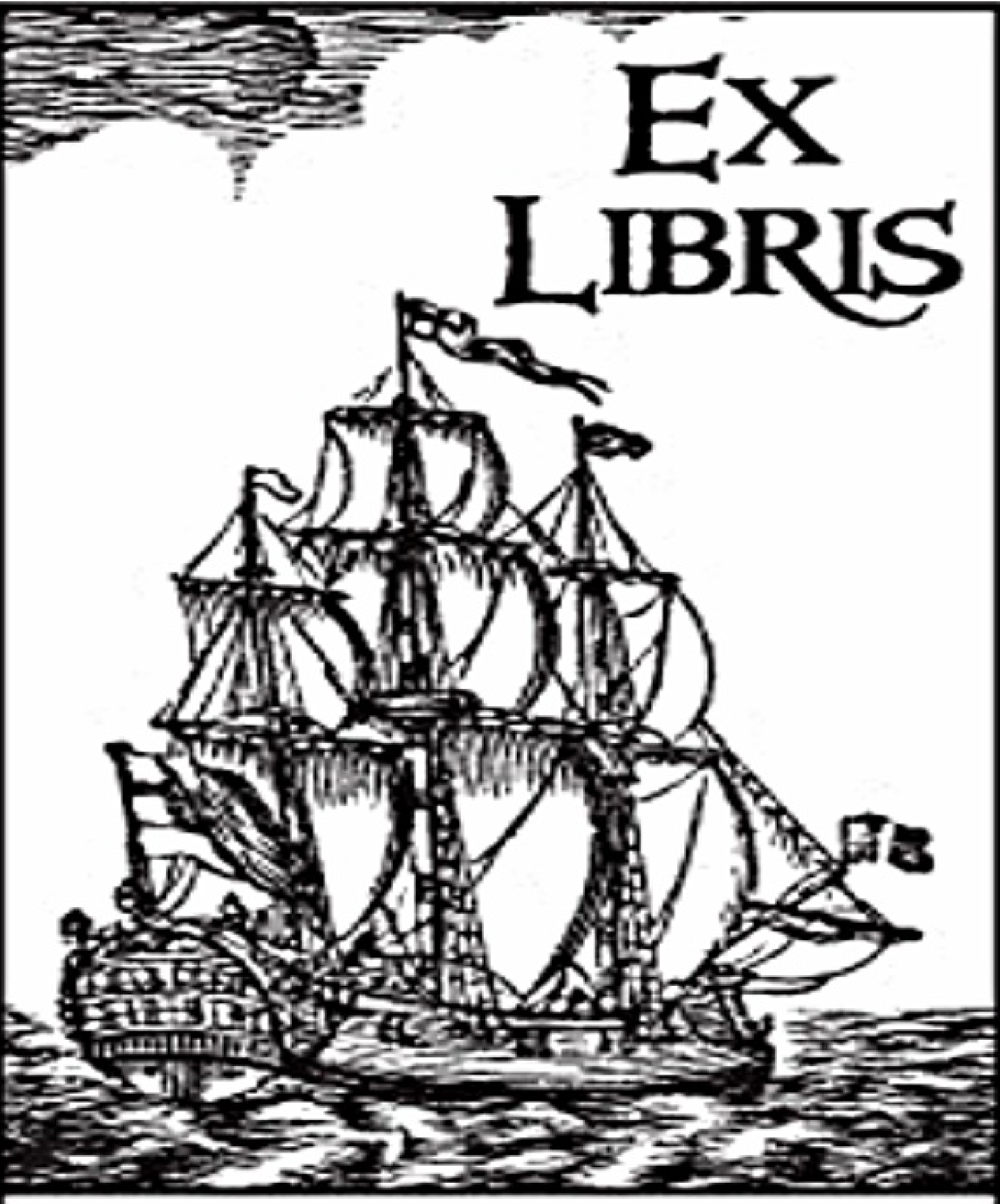
The newest wrinkle in tree trim is the "silhouette effect." This may be obtained with virtually any kind of tree, whether strictly ornamental or fruit-bearing. Fruit and nut trees can be made ornamental, at the same time retaining high productivity, in a single season. Follow any pattern you choose, to develop individualism.

To trim for ornamental effects, take off the branches as high as you wish, leaving those at the top to spread. For the silhouette, skin the remaining limbs from the trunk out toward the ends until you have remaining the desired foliage. Small limbs may be cut off with a concave-blade saw, attached to a pole of necessary length. Sever the limbs by pulling the saw toward you.

By observing a little precaution, you can cut limbs of any size without danger of splitting the cambium layer on the trunk. Limbs three inches in diameter or smaller should first be severed by pole or ordinary cross-cut saw three feet from the trunk. Then carefully cut the stub off flush with the outer side of the cambium layer and cover the scar with a sealing preparation, preferably emulsified asphalt.

Larger limbs, of no matter what diameter, may also be removed safely and easily by following these directions: With a cross-cut saw, cut upward five feet distant from the trunk through one-third of the limb's diameter. From the trunk side, notch a V, using an axe. With the notch completed, saw downward five or six inches nearer the trunk. When the weight causes the limb to sag, it will break off at the V, and will not strip off a long section of bark or split the trunk. Finally, cut off the stub as directed for smaller branches. and smear the sealing substance over the open wound. The cambium layer will continue feeding the tree and will re-grow without undue delay.

Never drive iron nails into or otherwise mar a tree, for it is from such simple beginnings that decay eats into limbs and trunk, giving termites an opportunity to bore long tunnels and eventually bring death to even the finest and largest specimen. Although



Anon. Malefactor